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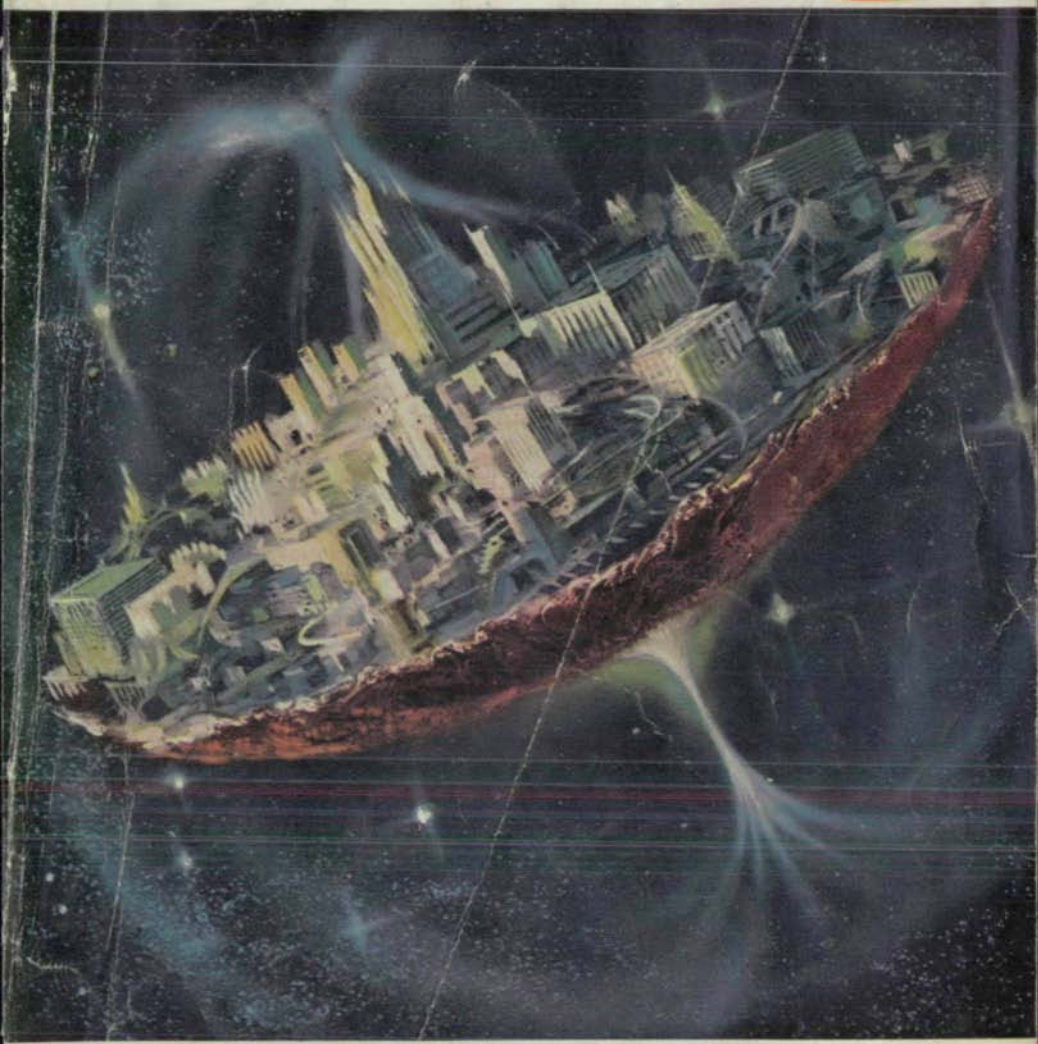

A LIFE FOR THE STARS by James Blish

A story of the industrial cities of space

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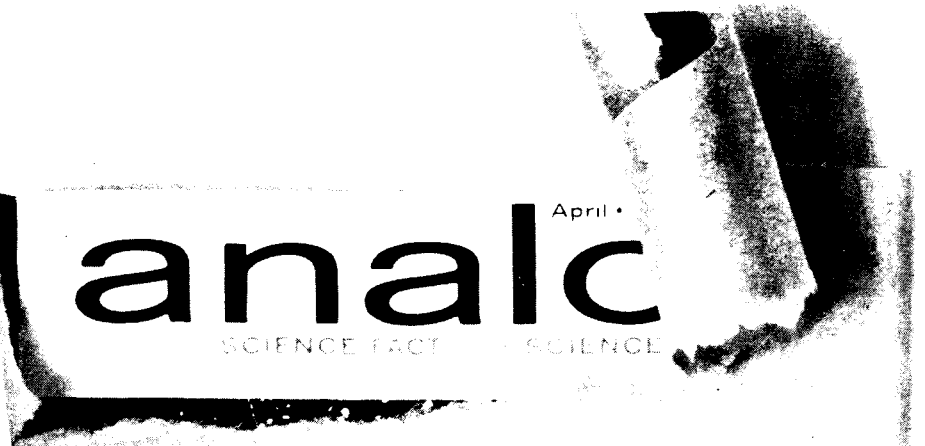

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JOHN W. CAMPBELL
Editor

KAY TARRANT
Assistant Editor

HERBERT STOLTZ
Art Director

ROBERT E. PARK
Business Manager

WALTER J. McBRIDE
Advertising Manager

Editorial and Advertising office: 420 Lexington Avenue, New York 17, N. Y.

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EDITORIAL BY JOHN V. CAMPBELL

Astrologer–Astronomer–Astro-engineer

On Page 83 in this issue we're carrying an article discussing the works of some of the greatest minds in the history of human science—Copernicus, Tycho Brahe, Johannes Kepler, Galileo, and Isaac Newton.

These men did certain work, concerning certain observational data, for certain motivations. They were five great Astrologers.

Running an article on the nature and development of astrology in this magazine—or any other magazine directed primarily to a technically oriented readership—calls for some explanation. It has been thoroughly, solidly, completely established, for a couple of centuries now, that astrology is superstitious nonsense.

Since that solid decision is now a couple of centuries old, and is flatly in contradiction of five of the keenest minds the human race is known to have produced, it is at least reasonable to review the decision at this point and see if modern data does, in fact, confirm the now centuries-old conclusions. (Be it remembered that, in essence, an "old superstition" is a conclusion reached by people several centuries previously, without adequate grounds, and which has not been rationally reviewed since. In that sense, the proposition "Astrology is superstitious nonsense" is itself a superstition!)

The two areas of research that most fascinated Isaac Newton were

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astrology and alchemy. Through a long period of the Renaissance the most able technically inclined minds of Mankind were engaged in studies of astrology and alchemy.

Alchemy—in the sense of the search for the Philosopher's Stone, and the transmutation of base metals to gold—proved a complete bust. Transmutation we now know is perfectly possible . . . but not by any chemical manipulation. The Philosopher's Stone was a completely false goal.

Astrology broke down into something considered quite different—Astronomy. We now say that Tycho Brahe was a great *astronomer*, and that those other great men were also early *astronomers*.

Were they? They didn't say so! To decide the question, we must, first, get some sort of a definition of the difference between "astrology" and "astronomy." You think you can do that easily? Oh . . . "Astrology is that superstitious nonsense about predicting future events on Earth by studying the positions of the stars and planets."

And how do the United States government agencies set about predicting the tides? By astrology—if that's the definition of Astrology.

Oh . . . that's different, because that's simple gravitational force computation? You mean, then, it ain't what you do, it's the way that you do it!"

Then Kepler couldn't help being an astrologer. Since gravity hadn't been defined at the time he was doing his work, when he computed tides by studying the aspects of the Sun and Moon, he was an astrologer. A later computer predicting tides by studying the aspects of the Sun and Moon, however, would not be an astrologer, even though he did exactly the same things, because he knew that gravity existed. That it?

Hm-m-m . . . and what *is* this "gravity"? Is it anything like "*elan vital*" or *phlogiston*? They explained observed phenomena also, though, at the time, they could not themselves be defined.

No, somehow that doesn't satisfy. The modern computer uses Kepler's laws, and the laws of that later, greater astrologer, Newton, and essentially not only does *what* Kepler did, but does it the *way* Kepler did.

It seems to me the real difference is purely subjective—which is why the oh-so-strictly-objective scientist doesn't care to try to define the difference. The difference is purely a matter of motivation—not of action nor of process. If Q. Publicus killed B. Marcus by running him through with his short sword, was Q. Publicus a murderer? No, Q. Publicus was the executioner designated by his Centurion to dispose of B. Marcus, traitor. Murder is determined not by action nor by method, but by motive.

And even that differentiation can get a bit subtle at times. Most alchemists got into the business

Continued on page 174

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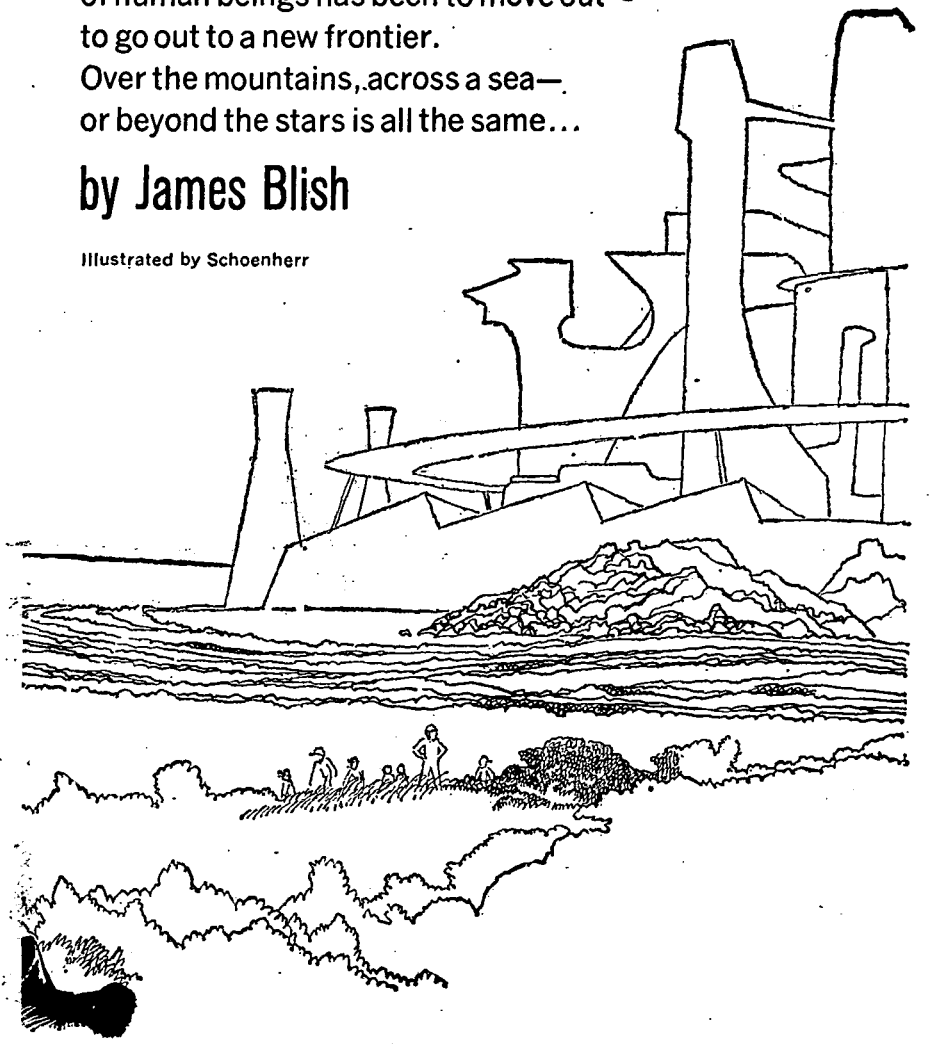
A Life For The Stars

First of Two Parts. "The way out" of troubles over many hundreds of generations of human beings has been to move out—to go out to a new frontier. Over the mountains, across a sea—or beyond the stars is all the same...

by James Blish

Illustrated by Schoenherr



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I

From the embankment of the long-abandoned Erie-Lackawanna-Pennsylvania Railroad, Chris sat silently watching the city of Scranton, Pennsylvania, preparing to take off, and sucked meditatively upon the red and white clover around him.

It was a first time for each of them. Chris had known since he had been a boy—he was sixteen now—that the cities were deserting the Earth; but he had never seen one in flight. Few people had, for the nomad cities, once gone, were gone for good.

Nor was it a very happy occasion, interesting though it was. Scranton was the only city Chris had ever seen, let alone visited, and the only one he was ever likely to see. It represented what small livelihood his father and his older brother had been able to scratch out of this valley; it was where the money was made, and where it was spent, somehow always managing to go faster than it came in.

Scranton had become steadily greedier as the money to be made dwindled; but somehow never greedy enough. Now, as it had for so many other towns, the hour of the city's desperation had struck. It was going into space, to become a migrant worker among the stars.

The valley sweltered in the mercilessly hot July sunlight, and the smoke from the plant chimneys rose straight up. There were only a few smokestacks going, though, and those would be shut down shortly, until the city should find another planet on which to work. Nothing would be allowed to smoke in the confined air of a star-cruising vessel, even as big a one as a city—not so much as a cigarette.

Down at the bottom of the railroad embankment, where the tar-paper shacks huddled, a red-necked man in an undershirt and levis scratched at a kitchen garden with a hoe. Chris wondered if he knew what was about to happen. Certainly he was paying no attention; maybe he just didn't care. Chris' own father had reached that gloomy state of mind long ago. But all the same, it was odd that there were no sight-seers other than Chris himself.

A circular belt of cleared land, nothing but raw, red, dry earth, ran around the city, separating it from the shacks, from the battered and flaking suburbs, and from all the rest of the world. Inside it, the city looked the same as always, even to the yellow and orange glare of the slagheaps. Scranton was going to leave half its homes behind, but it was taking the slagheaps along; they were part of its stock in trade. Somewhere, out among the stars, there would be a frontier planet with iron ore to process; somewhere else, a planet with a use for slag, or something that might be extracted from slag—a use still beyond speculation,

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but not to be foreclosed by short-sightedness. People, on the other hand, were largely useless; weight for weight, the slag would be worth more.

At least, that was the hope. What was certain was that there was no more iron ore on Earth worth processing. The voracious second millennium—the books called it "the Age of Waste"—had used it all up, except for such artificial mines as used-car dumps and other deposits of scrap and rust. There was still native iron on Mars, of course, but none of that was available for Scranton. Pittsburgh was already on Mars, as well equipped with guns as with blast furnaces. Besides, Mars was too small a planet to support more than one steel town, not because the red world was short of iron, but because it was short of oxygen, which was also essential for the making of steel.

Any work Scranton might want to do now would have to live beyond the reaches of the solar system. There was no iron on the moon or Mercury that a steel town could afford to process—and no iron at all on the other six planets, the five gas giants and the remote ice-ball that was Pluto.

The man in the kitchen garden straightened, leaned his hoe against the back of his shack, and went inside. Now the valley outside the raw-earth circle looked deserted indeed, and it suddenly occurred to Chris that this might be more than an appearance. Was there something dangerous about being too close to a city under a spindizzy field? Were he and the lone gardener being foolhardy?

At the moment, the whole world was silent except for the distant grumbling of Scranton itself. He knew he had nothing to fear from the railbed behind him, for the tracks had been torn up long ago to feed the furnaces. There was a legend in the valley that on quiet nights one could still hear the *Phoebe Snow* going by, but Chris scoffed at such fairy tales. (Besides, his father had told him, that had been a daytime train.) Even the ties were gone, burned as firewood by the shack-dwellers through generations of harsh Pennsylvania winters.

He racked his memory for what little he knew about the behavior of spindizzies, but could come up with nothing but that they were machines and that they lifted things. Though his schooling had been poor and spasmodic, he was a compulsive reader, devouring even the labels on cans if there was nothing else available; but the physics of interstellar flight is an impossible discipline to grasp even for an advanced student without a first-rate teacher to help, and the closest Chris had ever come to a good teacher was Scranton's public librarian. She tried hard; but she did not know the subject.

As a result, Chris stayed where he

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was. He would probably have done so even had he known positively that there was some danger; for in the valley, anything new was a change—even the fact, disastrous though it was, that Scranton was about to go as permanently out of his life and world as Betelgeuse. His own life thus far had held little but squirrel-trapping, stealing eggs from neighbors as badly off as his own family, hunting scrap to sell to the mills, helping Bob nurse their father through repeated bouts of an illness which, but for the fact that there was no one in Thirty-second Century America to diagnose it, would have been recognized as the ancient African scourge of kwashiorkor or malignant malnutrition, keeping the little girls out of the berry patch, fishing for fingerlings, and watching the rockets of the rich howl remotely through the highest reaches of the indifferent sky.

He had often thought of leaving, though he had no trade to practice and knew of no place in the world where his considerable, but utterly untrained brute strength, could be sold at any price. But there was loyalty and love in the motherless family, and it had often before sustained them when there had been nothing to eat but fried dough and green tomatoes, and no warmth against the Christmas snows but huddling with the little kids under a heap of the old rags that were their clothes; and in the end, Chris stuck by it as stubbornly and devotedly as Bob always had. In all the depopulated Earth there was no place to which he owed more loyalty, and no place which could offer him more in return—the worst possible substrate for dreams of escape, even for a temperament as naturally sunny and sanguine as Chris'. In a world where a Ph.D. in economics could find no one to teach, nor use his knowledge of how the economy wagged to find any other niche in it—a world in which a thousand penny-ante jobs left him no time even to tend his wife's grave, yet all the same paid him less and less every year—what hope could his boys reasonably cherish for any better future? The answer, alas, was all too obvious; and for the little girls, the foreseeable future was even more grim.

The nomad cities offered no better way of escape. More often than not, Chris had read, star-roving was simply another form of starvation, without even the company of a blue sky, a scrub forest or a patch of ground to grow turnips in. Otherwise, why did almost every city which had ever left the Earth fail to come back home? Pittsburgh had made its fortune on Mars, to be sure—but it was a poor sort of fortune that kept you sitting in a city all your life, with nothing to see beyond the city limits but an ochre desert, a desert with no air you could breathe, a desert that would freeze you solid only a few minutes after the tiny sun went down. Sooner or later, too, his

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father said, Pittsburgh would have to leave the solar system as all the other cities had—not, this time, because it had exhausted the iron and the oxygen, but because there would be too few people left on the Earth to buy steel. There were already too few to justify Pittsburgh's coming back to the once-golden triangle of rivers it had abandoned thirty years ago; Pittsburgh had wealth, but was finding it increasingly hard to spend on the Earth, even for necessities. The nomad cities seemed, like everything else, to be a dead end.

Nevertheless Chris sat on the embankment and watched, for only a single, simple reason: Something was going on. If he envied the city its decision to leave the valley, he was unaware of it. He was there simply to see something happen, for a change.

A brief rustle of shrubbery behind him made him turn. A dog's head peered across the roadbed at him from the foot of the mountainside, surrounded incongruously by the trumpets of tiger lilies; it looked a little like it was being served up on a platter. Chris grinned.

"Hello, Kelly. Look out for bees."

The dog whuffed and came trotting to him, looking foolishly proud of itself—as it probably was, for Kelly was usually not very good at finding anything, even his own way home. Bob, whose dog Kelly officially was, said that Kelly was a combination of Kerry blue and collie—hence the name—but Chris had never seen a pure sample of either breed, and Kelly did not look anything like the pictures of either. He looked, in point of fact, like a shaggy mutt, which was fortunate for him, since that is what he was.

"What do you make of it, Handsome? Think they'll ever get that thing off the ground?"

Kelly gave an imitation of a dog trying to think, registered pain, wagged his tail twice, woofed at a butterfly and sat down, panting. It had obviously always been his impression that he belonged to Chris, an impression Bob had wisely never tried to discourage. Explaining something that abstract to Kelly was (a) a long and complicated task, and (b) utterly hopeless anyhow. Kelly earned his own keep—he caught rabbits—which made up for the nuisance he was when he caught a porcupine; so nobody in the family but Chris much cared who he thought he belonged to.

There was at last some activity around the parching city. Small groups of men, made so tiny by distance that they were almost invisible except for their bright yellow steelworkers' helmets, were patrolling the bare perimeter. There was probably a law about that, Chris reflected. Equally probably it would be the last Earth law Scranton would ever be *obliged* to observe—no matter how many of them the city fathers took into space of their own free will. No doubt the patrol

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was looking for rubbernecks who might be standing too close for safety.

He imagined it so vividly that for a moment he had the illusion of hearing their voices. Then he realized with a start that it was not an illusion. A flash of yellow hard hats revealed another group of patrollers working their way through the shacks at the foot of the embankment, and coming in his direction.

With the ingrained prudence of the lifelong poacher, he took at once to the bushes on the other side of the roadbed. Not only would he be invisible from there, but, of course, he could no longer see the patrol; however, he could still hear it.

". . . Anybody in these shacks. Ask me, it's a waste of time."

"The boss says look, so we look, that's all. Myself, I think we'd make out better in Nixonville."

"Them tramps? They can smell work ten miles away. People on this side of town, they used to *look* for work. Not that there ever was any."

Chris cautiously parted the shrubbery and peered out. The gang was still out of sight, but there was another group coming toward him from the other direction, walking along the old roadbed. He let the bushes swing closed hastily, wishing that he had retreated farther up the mountainside. It was too late for that now, though. The new patrol was close enough to hear the brush rustle, and would probably see him, too, if he was in motion.

Down in the valley there was a sudden, slight hum, like bee-buzz, but infinitely gentler, and deeper in tone. Chris had never heard anything exactly like it before, but there could be no doubt in his mind about what it was: Scranton's spindizzies were being tuned. Was he going to have to hide right through the take-off, and miss seeing it? But surely the city wouldn't leave until its patrols were back on board!

The voices came closer, and beside him Kelly growled softly. The boy grasped the dog firmly by the scruff and shook him gently, not daring to speak. Kelly shut up, but all his muscles were tensed.

"Yeh! Look what we got here!"

Chris froze as completely as a rabbit smelling fox; but another voice struck in at once.

"You guys get outa here. This here's my place. You got no business with me."

"Yeah? You didn't hear anything about getting out of the valley by noon today? There's a poster on your own front door that says so. Can't read, huh, Jack?"

"I don't do everything any piece of paper says. I live here, see? It's a lousy dump, but it's mine, and I'm staying, that's all. Now blow, will you?"

"Well, now, I don't know if that's all, Jack. It's the law that you're supposed to be vacated. *We* don't want your shack, but it's the law, see?"

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"It's the law that I got a right to my own property, too."

A new voice chimed in from the embankment, not fifteen feet from where Chris and Kelly crouched. "Trouble down there, Barney?"

"Squatter. Won't move. Says he owns the place."

"That's a laugh. Get him to show you his deed."

"Ah, why bother with that? We ain't got the time. Let's impress him and get moving."

"*No you don't*—"

There was the meaty sound of a blow landing, and a grunt of surprise. "Hey, he wants to play rough! All right, mister—"

More impacts, and then the sound of something smashing—glass or crockery, Chris guessed, but it might have been furniture. Before Chris could do more than grab at him convulsively, Kelly burst into a volley of high, howling yelps, broke free, crashed out of the bushes and went charging across the embankment toward the fracas.

"Look out! Hey—where'd that mutt come from?"

"Out of the bushes there. Somebody's in there still. Red hair, I can see it. All right, Red, out in the open—on the double!"

Chris rose slowly, ready to run or fight at the drop of a hard hat. Kelly, on the far side of the embankment, gave up his idiot barking for a moment, his attention divided between the struggle in the shack and the group now surrounding Chris.

"Well, Red, you're a husky customer. I suppose you didn't hear about any vacate order, either."

"No, I didn't," Chris said defiantly. "I live in Lakebranch. I only came over to watch."

"Lakebranch?" the leader said, looking at another of his leathery-faced patrol-mates.

"Hick town, way out back some place. Used to be a resort. Nothing out there now but poachers and scratchers."

"That's nice," the other man said, tipping back his yellow helmet and grinning. "Nobody'll miss you, I guess, Red. Come along."

"What do you mean, come along?" Chris said, his fists clenching. "I have to be home by five."

"Watch it—the kid's got some beef on him."

The other man, now clearly in charge, laughed scornfully. "You scared? He's a kid, isn't he? Come on, Red, I got no time to argue. You're here past noon, we got a legal right to impress you."

"I told you, I'm due home."

"You should have thought of that before you came here. Move along. You give us a hard time, we give you one, get it?"

Below, three men came out of the shack, holding hard to the gardener Chris had seen earlier. All looked considerably battered, but the sullen redneck was secured all the same.

"We got this one—no thanks to you guys. Thought you was going to be right down?"

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"Got another one, Barney. Let's go, Red."

The press-gang leader took Chris by the elbow. He was not unnecessarily violent about it, but the movement was sudden enough to settle matters in Kelly's slow brain. Kelly was unusually stupid, even for a dog, but he now knew which fight interested him most. With a snarl which made even Chris' hackles rise—he had never in his life before heard a dog make such a noise, let alone Kelly—the animal streaked back across the embankment and leapt for the big man's legs.

In the next thirty seconds of confusion Chris might easily have gotten away—there were a hundred paths through the undergrowth that he might have taken that these steel-puddlers would have found it impossible to follow—but he couldn't abandon Kelly. And with an instinct a hundred thousand years old, the patrol fell on the animal enemy first, turning their backs on the boy without even stopping to think.

Chris was anything but a trained in-fighter, but he had instincts of his own. The man with Kelly's teeth in him was obviously busy enough. Chris lobbed a knobkerry fist at the man next to him. When the target looked stunned but failed to fall, Chris threw the other fist. It didn't land where Chris had meant it to land, exactly, but the man staggered away anyhow, which was good enough. Then Chris was in the middle of the melee and no longer had any chance even to try to call his shots.

After a while, he was on the broken granite of the old roadbed, and no longer cared about Scranton, Kelly or even himself. His head was ringing. Over him, considerable swearing was going on.

"More trouble than he's worth. Give him a shoe in the head and let's get back!"

"No. No killing. We can impress 'em, but we can't bump 'em off. One of you guys see if you can slap Huggins awake."

"What are you . . . chicken all of a sudden?"

The press-gang leader was breathing hard, and as Chris' sight cleared, he saw that the big man was sitting on the ground wrapping a bloody leg in a length of torn shirt. Nevertheless he said evenly: "You want to kill a kid because he gave you a fight? That's the lousiest excuse for killing a man I ever heard, let alone a kid. You give me any more of that, I'll take a poke at you myself."

"Ah, shaddup, will you?" the other voice said surlily. "Anyhow we got the dog—"

"You loud-mouthed—*look out!*"

Two men grabbed Chris, one from each side, as he surged to his feet. He struggled fiercely, but all the fight left in him was in his soul, not any in his muscles.

"What a bunch of flap-jaws. No wonder you can't hold your own with a kid. Huggins, put your hat

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on. Red, don't you listen to that slob, he's been all mouth all his life. Your dog ran away, that's all."

The lie was kindly meant, no matter how clumsy it was, but it was useless. Chris could see Kelly, not far away. Kelly had done the best he could; he would never have another chance.

The youngster the press gang dragged stumbling toward Scranton had a heart made of stone.

II

The city inside the perimeter of raw earth was wavery and unreal. It did not hum any more, but it gave a puzzling impression of being slightly in shadow, though the July sun was still blazing over it. Even in his grief and anger, Chris was curious enough to wonder at the effect, and finally he thought he saw what caused it: The heat waves climbing the air around the town seemed to be detouring it, as though the city itself were inside a dome. No, not a dome, but a bubble, only a part of which was underground; it met the earth precisely at the cleared perimeter.

The spindizzy field was up. It was invisible in itself, but it was no longer admitting the air of the Earth.

Scranton was ready.

Thanks to the scrapping, the patrol was far behind schedule; the leader drove them all through the scabrous, deserted suburbs without any mercy for his own torn leg. Chris grimly enjoyed watching him wince at every other step, but the man did not allow the wound to hold him up, nor did he let any of the lesser bruises and black eyes in the party serve as excuses for foot-dragging.

There was no way to tell, by the normal human senses, when the party passed through the spindizzy screen. Midway across the perimeter, which was a good five hundred feet wide, the leader unshipped from his belt a device about as big as an avocado, turned it in his hands until it whined urgently, and then directed the group on ahead of him in single file, along a line which he traced in the dry red ground with the toe of his boot.

As his two guards left his side, Christ crouched instinctively. He was not afraid of them, and the leader apparently was going to stay behind. But the big man saw the slight motion.

"Red, I wouldn't if I were you," he said quietly. "If you try to run back this way after I turn off this gadget—or if you try to go around me—you'll go straight up in the air. Look back and see the dust rising. You're a lot heavier than a dust-speck, and you'll go up a lot farther. Better relax—take it from me."

Chris looked again at the dubious boundary-line he had just crossed. Sure enough, there was a hair-thin ruling there, curving away to both sides as far as he could see, where the inert friable earth seemed to be

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turning over restlessly. It was as though he was standing inside a huge circle of boiling dust.

"That's right, that's what I meant. Now look here." The press-gang leader bent and picked up a stone just about as big as his fist—which was extraordinarily big—and shied it back the way they had come. As the rock started to cross the line above the seething dust, it leaped skyward with an audible screech, like a bullet ricocheting. In less than a second, Chris had lost sight of it.

"Fast, huh? And it'd throw you much farther, Red. In a few minutes, it'll be lifting a whole city. So don't go by how things look. Right where you stand, you're not even on the Earth any more."

Chris looked at the mountains for a moment, and then back at the line of boiling dust. Then he turned away and resumed marching toward Scranton.

And yet they were now on a street Chris had traveled a score of times before, carrying fifty cents for the Sunday paper's Help-Wanted ads, or rolling a wheelbarrow not quite full of rusty scrap, or bringing back a flat package of low-grade ground horsemeat. The difference lay only in the fact that just beyond the familiar corner the city stopped, giving place to the new desert of the perimeter—and all in the over-arching shadow which was not a shadow at all.

The patrol leader stopped and

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looked back. "We'll never make it from here," he said finally. "Take cover. Barney, watch that redneck. I'll take the kid with me; he looks sensible."

Barney started to answer, but his reply was drowned out by a prolonged fifty-decibel honking which made the very walls howl back. The noise was horrifying; Chris had never before heard anything even a fraction so loud, and it seemed to go on forever. The press-gang boss herded him into a doorway.

"There's the alert. Duck, you guys. Stand still, Red. There's probably no danger—we just don't know. But something might just shake down and fall—so keep your head in."

The honking stopped; but in its place Chris could hear again the humming, now so pervasive that it made his teeth itch in their sockets. The shadow deepened, and out in the bare belt of earth the seething dust began to leap into the air in feathery plumes almost as tall as ferns.

Then the doorway lurched and went askew. Chris grabbed for the frame; and just in time, for a second later, the door jerked the other way; and then, back again. Gradually, the quakes became periodic, spacing themselves farther apart in time, and slowly weakening in violence.

After the first quake, however, Chris' alarm began to dwindle into amazement, for the movements of the ground were puny compared to what was going on before his eyes. The whole city seemed to be rocking heavily, like a ship in a storm. At one instant, the street ended in nothing but sky; at the next, Chris was staring at a wall of sheared earth, its rim looming clifflike fifty feet or more above the new margin of the city; and then the blank sky was back again—

These huge pitching movements should have brought the whole city down in a roaring avalanche of steel and stone. Instead, only these vague twitchings and shudderings of the ground came through, and even those seemed to be fading away. Now the city was level again, amidst an immense cloud of dust, through which Chris could see the landscape begin to move solemnly past him. The city had stopped rocking, and was now turning slowly. There was no longer even the slightest sensation of movement; the illusion that it was the valley that was revolving around the city was irresistible and more than a little dizzying.

I can see where the spindizzy got its name, Chris thought. *Wonder if we go around like a top all the time we're in space? How'll we see where we're going?*

But now the high rim of the valley was sinking. In a breath, the distant roadbed of the railroad embankment was level with the end of the street; then the lip of the street was at the brow of the mountain; then with the treetops . . . and then there was nothing but blue sky, becoming rapidly darker.

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The big press-gang leader released an explosive sigh. "By thunder," he said, "we got her up." He seemed a little dazed. "I guess I never really believed it till now."

"Not so sure I believe it yet," the man called Barney said. "But I don't see any cornices falling—we don't have to hang around here any longer. The boss'll have our necks for being even this late."

"Yeah, let's move. Red, use your head and don't give us any more trouble, huh? You can see for yourself, there's no place to run now."

There was no doubt about that. The sky at the end of the street, and overhead too, was now totally black; and even as Chris looked up, the stars became visible—at first only a few of the brightest, but the others came out steadily in their glorious hundreds. From their familiar fixity Chris could also deduce that the city was no longer rotating on its axis, which was vaguely reassuring, somehow. Even the humming had faded away again; if it was still present, it was now inaudible in the general noise of the city.

Oddly, the sunlight was still as intense as ever. From now on, "day" and "night" would be wholly arbitrary terms aboard the city; Scranton had emerged into the realm of Eternal daylight-saving time.

The party walked two blocks, and then stopped while the big man located a cab post and pulled the phone from it. Barney objected at once.

"It'll take a fleet of cabs to get us all to the Hall," he complained. "And we can't get enough guys into a hack to handle a prisoner, if he gets rough."

"The kid won't get rough. Go ahead and march your man over. I'm not going to walk another foot on this leg."

Barney hesitated, but obviously the big man's marked limp was an unanswerable argument. Finally he shrugged and herded the rest of his party around the corner. His boss grinned at Chris; but the boy looked away.

The cab came floating down out of the sky at the intersection and maneuvered itself to rest at the curb next to them with a finicky precision. There was, of course, nobody in it; like everything else in the world requiring an I.Q. of less than 150, it was computer-controlled. The world-wide dominance of such machines, Chris' father had often said, had been one of the chiefest of contributors to the present and apparently permanent depression: the coming of semi-intelligent machines into business and technology had created a second Industrial Revolution, in which only the most highly creative human beings, and those most gifted at administration, found themselves with any skills to sell which were worth the world's money to buy.

Chris studied the cab with the liveliest interest, for though he had

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often seen them before from a distance, he had of course never ridden in one. But there was very little to see. The cab was an egg-shaped bubble of light metals and plastics, painted with large red-and-white checkers, with a row of windows running all around it. Inside, there were two seats for four people, a speaker-grille, and that was all; no controls and no instruments. There was not even any visible place for the passenger to deposit his fare.

The big press-gang leader gestured Chris into the front seat, and himself climbed into the back. The doors slid shut simultaneously from ceiling and floor, rather like a mouth closing, and the cab lifted gently until it hovered about six feet above street level.

"Destination?" the Tin Cabby said cheerily, making Chris jump.

"City Hall."

"Social Security number?"

"One five six one one dash zero nine seven five dash zero six nine eight two one seven."

"Thank you."

"Shaddup."

"You're welcome, sir."

The cab lifted vertically, and the gang captain settled back into his seat. He seemed content for the moment to allow Chris to sightsee out the windows at the passing stubby towers of the flying city; he looked relaxed and a little indulgent, but a little wary, too. Finally he said:

"I need to Dutch-uncle you a little, Red. I didn't call a cab because of the leg—I've walked farther on worse. Feel up to listening?"

Chris felt himself freezing. Distracted though he was by all this enormous budget of new experience, and the vast reaches of the unknown which stretched before him, the press-gang leader's remark reminded him instantly of Kelly, and as instantly made him ashamed that he had forgotten. In the same rush of anger he remembered that he had been kidnaped, and that now there was no one left to take care of his father and the little kids but Bob. That had been hard enough to do when there had been two of them. It was bad enough that he would never see Annie and Kate and Bob and his father again, but far worse that they should be deprived of his hands and his back and his love; and worst of all, they would never know what had happened.

The little girls would only think that he and Kelly had run away, and wonder why, and mourn a little until they forgot about it. But Bob and his father might well think that he'd deserted them . . . most likely of all, that he had gone off with Scranton on his own hook, leaving them all to scrounge for themselves.

There was a well-known, ugly term for that among the peasantry of Earth, expressing all the contempt it felt for any man who abandoned his land, no matter how unrewarding it was, to tread the alien streets and starlanes of a nomad city: it was called, "going Okie."

Chris had gone Okie. He had not

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done it of his own free will, but his father and Bob and the little girls would never know that. For that matter, it would never have happened had it not been for his own useless curiosity; and neither would the death of poor Kelly, who, Chris now remembered too, had been Bob's dog.

The big man in the hard hat saw his expression close down, and made an impatient gesture. "Listen, Red, I know what you're thinking. What good would it do now if I said I was sorry? What's done is done; you're on board, and you're going to stay on board. We didn't put the snatch on you, either. If you didn't know about the impressment laws, you've got your own ignorance to blame."

"You killed my brother's dog."

"No I didn't. I've got a bad rip or two under that rag to prove I had reasons to kill him; but I wasn't the guy who did it, and I wouldn't have done it, either. But that's done too, and can't be undone. Right now I'm trying to help you, and I've got about three minutes left to do it in, so if you don't shut up and listen it'll be too late. You *need* help, Red; can't you understand that?"

"Why do you bother?" Chris said bitterly.

"Because you're a bright kid and a fighter, and I like that. But that's not going to be enough aboard an Okie city, believe me. You're in a situation now that's totally new to you, and if you've got any skills you can make a career on here, I'll be darned surprised, I can tell you that. And Scranton isn't going to start educating you this far along in your life. Are you smart enough to take some advice, or aren't you? If you aren't, there's no sense in my bothering. You've got about a minute left to think it over."

What the big man said made a bitter dose to have to swallow, but it did seem to make sense. And it did seem likely, too, that the man's intentions were good—otherwise, why would he be taking the trouble? Nevertheless Chris' emotions were in too much of a turmoil for him to trust himself to speak; instead, he merely nodded mutely.

"Good for you. First of all, I'm taking you to see the boss—not the mayor, he doesn't count for much, but Frank Lutz, the city manager. One of the things he'll ask you is what you do, or what you know about. Between now and when we get there, you ought to be thinking up an answer. I don't care what you tell him, but tell him *something*. And it had better be the thing you know the most about, because he'll ask you questions."

"I don't know anything—except gardening, and hunting," Chris said grimly.

"No, no, that's not what I mean. Don't you have any book subjects? Something that might be useful in space? If you don't, he'll put you to work pitching slag—and you won't have much of a lifetime as an Okie."

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The cab slowed, and then began to settle.

"And if he doesn't seem interested in what you tell him, *don't* try to satisfy him by switching to something else. No true specialist really knows more than one subject, especially at your age. Stick to the one you picked and try to make it sound useful. Understand?"

"Yes, but—"

"No time left for 'buts'. One other thing: If you ever get into a jam on board this burg, you'll need to know somebody to turn to, and it'd better not be Frank Lutz. My name is Frad Haskins—not Fred but Frad, F-R-A-D."

The cab hovered for a moment, and then its hull grated against cobblestones and the doors slid open. Chris was thinking so hard and in so many directions that for a long moment he did not understand what the press-gang chief was trying to convey by introducing himself. Then the realization hit home, and Chris was struggling unsuccessfully to blurt out his thanks and to give his own name at the same time.

"Destination, gentlemen," the Tin Cabby said primly.

"Shaddup. Come along, Red."

Frank Lutz, the city manager of Scranton-in-flight, reminded Chris instantly of a skunk—but by this Chris meant not at all what a city boy would have meant by a skunk. Lutz was small, sleek, handsome, and plump, and even sitting behind his desk, he gave an appearance of slight clumsiness. As he listened to Haskins' account of the two impressments, even his expression had something of the nearsighted amiability of the wood-pussy; but as Haskins finished, the city manager looked up suddenly—and Chris knew, if he had ever been in any doubt about it before, that this animal was also dangerous . . . and never more so than when it seemed to be turning its back.

"That impressment law was a nuisance. But I suppose we'll have to make a show of maintaining our pickups until we get to some part of space where the police aren't so thick."

"We've got no drug for them, that's for sure," Haskins agreed obscurely.

"That's not a public subject," Lutz said, with such deadly coldness that Chris was instantly convinced that the slip, whatever its meaning, had been intended by Haskins for his own ears. The big man was a lot more devious than his size or his bluffness suggested, that much was becoming clearer every minute. "As for these samples, I don't suppose they can do anything. They never can."

The deceptively mild hazel eyes, watery and inoffensive, swung suddenly to bear on the redneck. "What's your name?"

"Who wants to know? That's what I want to know. You got no right—"

"Don't buck me, bum, I haven't

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got the time. So you've got no name. Have you got a trade?"

"I'm no bum, 'm a puddler," the redneck said indignantly. "A *steel* puddler."

"Same thing. Anything else?"

"I been a puddler twenty years. 'M a Master Puddler, fair an' square. I got seniority, see? I don' need to be anything else, see? I got a trade. Nobody knows it like I do."

"Been working lately?" the city manager said quietly.

"No. But I got seniority. And a card. 'M no bum, 'm a craftsman see?"

"If you were a Genius Puddler I couldn't use you, buddy . . . not even if, as and when we ever see any steel again. This is a Bessemer-process town, and it was one even back when you were an apprentice. You didn't notice? Tough. Barney, Huggins, this one's for the slag-heaps."

This order was not executed without a good deal of renewed shouting and struggling, during which Lutz looked back down at his papers, as obviously harmless a critter as a skunk which had just happened upon a bird's egg and was wondering if it might bite, his small hands moving tentatively. When the noise was over, he said:

"I hope your luck was better, Frad. How about it, sonny? Have you got a trade?"

"Yes," Chris said instantly. "Astronomy."

"What? At your age?" The city manager stared at Haskins. "What's this, Frad—another one of your mercy projects? Your judgment gets worse every day."

"It's all news to me, boss," Haskins said with complete and obvious honesty. "I thought he was just a scratcher. He never said anything else to me."

The city manager drummed delicately on the top of his desk. Chris held his breath. His claim was ridiculous and he knew it, but he had been able to think of nothing else to answer which would have had a prayer of interesting the boss of a nomad city. In so far as he had been able to stay awake past dusk, Chris had read a little of everything, and of his reading he had retained best the facts and theories of history; but Haskins had cautioned him to espouse something which might be useful aboard an Okie city, and plainly it didn't qualify. The fragments of economics he had picked up from his father might possibly have been more useful had there been more of them, and those better integrated into *recent* history, but his father had never been well enough to do that job since Chris had reached the age of curiosity. He was left with nothing but his smattering of astronomy, derived from books most of which had been published before he was born, and from many nights spent lying on his back in the fields, breathing clover and counting meteors.

But he had no hope that it would work. A nomad city would need astronomy for navigating, primari-

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ly, a subject about which he knew nothing—indeed he lacked even the rudimentary trigonometry necessary to approach it. His knowledge of the parent subject, astronomy, was purely descriptive, and would become obsolete the minute Scranton was far enough away from the Sun to make the constellations hard to recognize—which in fact had probably happened already.

Nevertheless, Frank Lutz seemed to be a little bit baffled, for the first time. He said slowly:

"A Lakebranch kid who claims he's an astronomer! Well, at least it's new. Frad, you've let the kid sell you a hobby. If he ever got through grammar school I'll eat your tin hat, paint and all."

"Boss, I swear I never heard a word of all this until now."

"Hm-m-m. All right, sonny: Name the planets, going outward from the Sun."

That was easy, but the next ones would surely be harder. "Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, Proserpina."

"You left out a few, didn't you?"

"I left out about five thousand," Chris said, as steadily as he could manage. "You said planets—not asteroids or satellites."

"All right, what's the biggest satellite? And the biggest asteroid?"

"Titan, and Ceres."

"What's the nearest fixed star?"

"The Sun."

The city manager grinned, but he did not seem to be much amused. "Oho. Well, it won't be, not much longer. How many months in a light-year?"

"Twelve, just like any other year. A light-year isn't a measure of time, it's a measure of distance—the distance light travels in a year. Months don't have anything to do with it. You might as well ask how many weeks there are in an inch."

"There are fifty-two weeks to the inch—or it'll seem like that, once you're as old as I am." Lutz drummed on the desk again. "Where'd you get all this stuff? You won't pretend you had any schooling in Lakebranch, I hope?"

"My father taught almost all his life at the University, till it was shut down," Chris said. "He was the best there was. I got most of it from him. The rest I read about, or got from observation, and paper and pencil."

Here Chris was on firm ground, provided only that he be allowed one lie: the substitution of astronomy for economics. The next question did not bother him in the least, for it was thoroughly expectable:

"What's your name?"

"Crispin deFord," he said reluctantly.

There was a surprised guffaw from the remainder of the audience, but Chris did his best to ignore it. His ridiculous name had been a burden to him through so many childhood fights with the neighbors that he was now able to carry it with patience, though still not

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very gladly. He was surprised, however, to see Haskins raising his bushy bleached eyebrows at him with every evidence of renewed interest. What that meant, Chris had no idea; the part of his brain that did his guessing was almost worn out already.

"Check that, somebody," the city manager said. "We've got a couple of people left over from the S.U. faculty, at least. By Hoffa, Boyle Warner was a Scranton prof, wasn't he? Get him up here, and let's close this thing out."

"What's the matter, boss?" Haskins said, with a broad grin. "Running out of trick questions?"

The city manager smiled back, but again the smile was more than a little frosty. "You could call it that," he said, with surprising frankness. "But we'll see if the kid can fool Warner."

"The ole bassar must be good for something," somebody behind Chris mumbled. The voice was quiet, but the city manager heard it; his chin jerked up, and his fist struck a sudden, terrible blow on the top of his desk.

"He's good for getting us where we're going, and don't you forget it! Steel is one thing, but stars are another—we may never see another ingot without Boyle. Next to him we're *all* puddlers, just like that redneck. And that may go for the kid here, too."

"Ah, boss, don't lay it on. What can *he* know?"

"That's what I'm trying to find out," Lutz said, in a white fury. "What do you know about it? Anybody here know what a geodesic is?"

Nobody answered.

"Red, do you know?"

Chris swallowed. He knew the answer, but he found it impossible to understand why the city manager considered it worth all this noise.

"Yes, sir. It's the shortest distance between two points."

"Is that all?" somebody said incredulously.

"It's all there is between us and starvation," Lutz said. "Frad, take the kid below and see what Boyle says about him; on second thought, I don't want to pull Boyle out of the observatory, he must be up to his eyebrows in course-corrections. Get to Boyle as soon as he's got some free time. Find out if there ever was any Professor deFord at S.U.; and then get Boyle to ask the kid some hard questions. *Real* hard. If he makes it, he can be an apprentice. If he doesn't, there's always the slagheaps; this has taken too long already."

III

Even a city which has sloughed off its slums to go space-flying has hidey-holes, and Chris had lost no time in finding one of his own. He had located it with the simple instinct of a hunted animal going to ground.

Not that anybody was hunting for him—not yet. But something

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told him that it would be only a matter of time. Dr. Boyle Warner, the city's astronomer, had been more than kind to him, but he had asked hard questions all the same; and these had revealed quickly enough that Chris' knowledge of astronomy, while extraordinary in a youngster with no formal education worth mentioning, was too meager to be of any help to Dr. Warner or of any use to the city.

Dr. Warner signed him on as an apprentice anyhow, and so reported to the city manager's office, but not without carefully veiled misgivings, and an open warning:

"I can think of very little for you to do around the observatory that would be useful, Crispin, I'm sorry to say. If I so much as set you to work sweeping the place, one of Frank Lutz's henchmen would find out about it sooner or later; and Frank would point out quite legitimately that I don't need so big a fellow as you for so light a task as that. While you're with me, you'll have to appear to be studying all the time."

"I will be studying," Chris said. "That's just what I'd like."

"I appreciate that," Dr. Warner said sadly. "And I sympathize. But Crispin, it can't last forever. Neither I nor anyone else in Scranton can give you in two years the ten years of study that you've missed, let alone any part of what it took me thirty more years to absorb. I'll do my best, but that best can only be a pretense—and sooner or later they'll catch us at it."

After that, Chris already knew, would come the slagheaps—hence the hidey-hole. He wondered if they would send Dr. Warner to the slagheaps, too. It didn't seem very likely, for the frail, pot-bellied little astrophysicist could hardly last long at the wrong end of a shovel, and besides he was the only navigator the city had. Chris mentioned this guardedly to Frad Haskins.

"Don't you believe it," Frad said grimly. "The fact is that we've got no navigator at all. Expecting an astronomer to navigate is about like asking a chicken to fry an egg. Doc Warner ought to be a navigator's assistant himself, not a navigator-in-chief, and Frank Lutz knows it. If we ever run across another city with a spare *real* navigator to trade, Frank could send Boyle Warner to the slagheaps without blinking an eye. I don't say that he would, but he might."

It could hardly be argued that Haskins knew his boss, and after only one look of his own at Lutz, Chris was more than ready to agree. Officially, Chris continued to occupy the single tiny room at the university dormitory to which he had been assigned as Dr. Warner's apprentice, but he kept nothing there but the books that Dr. Warner loaned him, the mathematical instruments from the same

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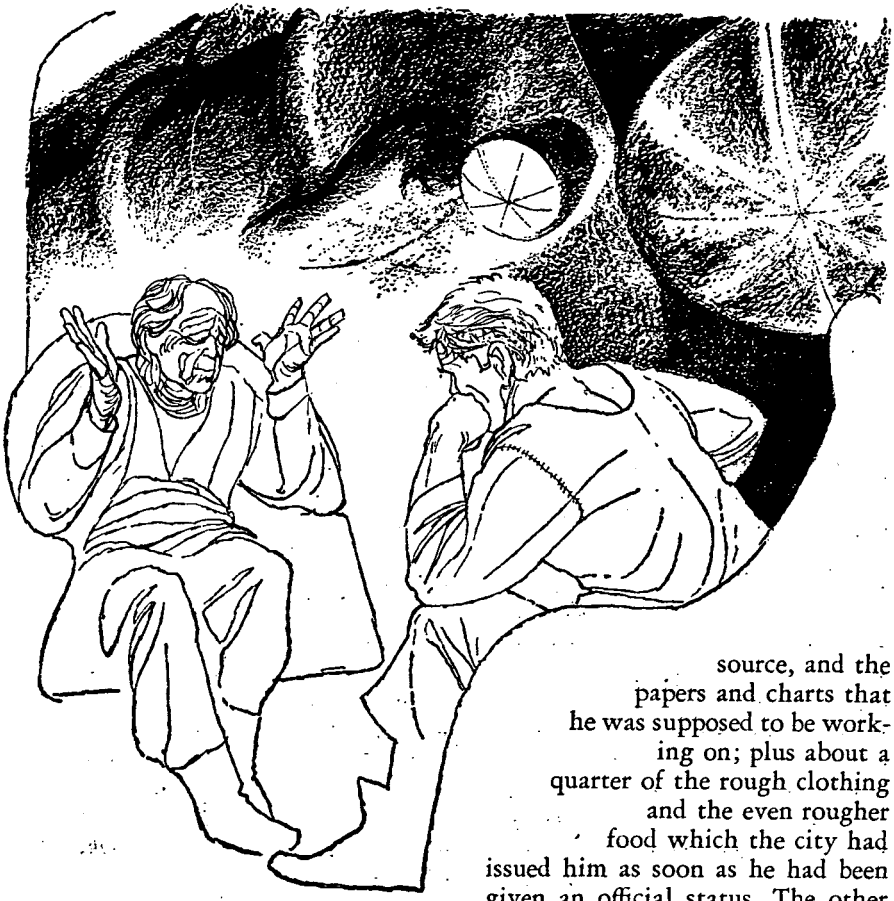

source, and the papers and charts that he was supposed to be working on; plus about a quarter of the rough clothing and the even rougher food which the city had issued him as soon as he had been given an official status. The other three quarters of both went into the hole, for Chris had no intention of letting himself be caught at an official address when the henchmen of Frank Lutz finally came looking for him.

He studied as hard in the hole as he did in the dormitory and at the observatory, all the same. He was firmly determined that Dr. Warner should not suffer for his dangerous

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kindness if there were anything that Chris could do to avoid it. Frad Haskins, though his visits were rare—he had no real business at the university—detected this almost at once; but he said only:

"I knew you were a fighter."

For almost a year Chris was quite certain that he was making progress. Thanks to his father, for example, he found it relatively easy to understand the economy of the city—probably better than most of its citizens did, and almost certainly better than either Frad Haskins or Dr. Warner. Once aloft, Scranton had adopted the standard economy of all tribes of highly isolated nomad herdsmen, to whom the only real form of wealth is grass: a commune, within which everyone helped himself to what he needed, subject only to the rules which established the status of his job in the community. If Frad Haskins needed to ride in a cab, for instance, he boarded it, and gave the Tin Cabby his social security number—but if, at the end of the fiscal year, his account showed more cab charges than was reasonable for his job, he would hear about it. And if he or anyone else took to hoarding physical goods—no matter whether they were loaves of bread or lock-washers, they could not by definition be in anything but short supply on board an Okie city—he would do more than hear about it: The penalties for hoarding of any kind were immediate and drastic.

There was money aboard the city, but no ordinary citizen ever saw it or needed it. It was there to be used exclusively for foreign trade—that is, to bargain for grazing rights, or other privileges and supplies which the city did not and could not carry within the little universe bounded by its spindizzy field. The ancient herdsmen had accumulated gold and jewels for the same reason. Aboard Scranton, the equivalent metal was germanium, but there was actually very little of it in the city's vaults; since germanium had been the universal metal base for money throughout this part of the galaxy ever since spaceflight had become practical, most of the city's currency was paper—the same "Oc dollar" everyone used in trading with the colonies.

All this was new to Chris in the specific situation in which he now found himself, but it was far from new to him in principle. As yet, however, he was too lowly an object in Scranton to be able to make use of his understanding; and remembering the penury into which his father had been driven back on Earth, he was far from sure that he would ever have a use for it.

As the year passed, so also did the stars. The city manager, according to Haskins, had decided not to cruise anywhere inside "the local group"—an arbitrary sphere fifty light-years in diameter, with

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Sol at its center. The planetary systems of the local group had been heavily settled during the great colonial Exodus of 2200–2400, mostly by people from Earth's fallen Western culture who were fleeing the then world-wide Bureaucratic State. It was Lutz's guess—quickly confirmed by challenges received by Scranton's radio station—that the density of older Okie cities would be too high to let a newcomer into competition.

During this passage, Chris busied himself with trying to identify the stars involved by their spectra. This was the only possible way to do it under the circumstances, for of course their positions among the constellations changed rapidly as the city overtook them. So did the constellations themselves, although far more slowly.

It was hard work, and Chris was often far from sure his identifications were correct. All the same, it was impressive to know that those moving points of light all around him were the almost legendary stars of colonial times, and even more impressive to find that he had one of those storied suns in the small telescope. Their very names echoed with past adventure: Alpha Centauri, Wolf 359, RD-4°4048′, Altair, 61 Cygni, Sirius, Kruger 60, Procyon, 40 Eridani. Only a very few of these, of course, lay anywhere near the city's direct line of flight—indeed, many of them were scattered "astern" (that is, under the keel of the city), in the imaginary hemisphere on the other side of his home Sun. But most of them were at least visible from here, and the rest could be photographed. The city, whatever Chris thought of it as a home, had to be given credit for being a first-class observatory platform

How he saw the stars was another matter, and one that was a complete mystery to him. He knew that Scranton was not traveling at a velocity many times that of light, and it seemed to him that under these circumstances there should have been no stars at all still visible in the city's wake, and those to the side and even straight ahead should be suffering considerable distortion. Yet in fact he could see no essential change in the aspect of the skies. To understand how this could be so would require at least some notion of how the spindizzies worked, and on this theory Dr. Warner's explanations were even more unclear than usual . . . so much so that Chris suspected him of not understanding it any too well himself.

Lacking the theory, Chris' only clue was that the stars from Scranton-in-flight looked to him much as they always had from a field in the Pennsylvania backwoods, where the surrounding Appalachians had screened him from the sky-glare of Scranton-on-the-ground. From this he deduced that the spindizzy screen, though itself invisible, cut down the apparent brightness of the stars by about

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three magnitudes, as had the atmosphere of the Earth in the region where Chris had lived. Again he didn't know the reason why, but he could see that the effect had some advantages: For instance, it blanked out many of the fainter stars completely to the naked eye, thus greatly reducing the confusing multitudes of stars which would otherwise have been visible in space. Was that really an unavoidable effect of the spindizzy field—or was it instead something imposed deliberately, as an aid to navigation?

"I'm going to ask Lutz that question myself," Dr. Warner said, when Chris proposed it. "It's no help to me; in fact, it takes all the fun out of being an astronomer in free space. And there's no time like the present. Come along, Crispin—I can't very well leave you in charge, and the only other logical place for Lutz to see an apprentice of mine is with me."

It seemed to Chris that nobody aboard Scranton ever said anything officially to him but "Come along," but he went. He did not relish the prospect of seeing the city manager again, but it was probably true that he would be safer under the astronomer's wing than he would be any place else; in fact, he was both surprised by and a little admiring of Dr. Warner's boldness.

But if Boyle Warner ever asked the question, Chris never heard the answer.

Frank Lutz did not believe in making people who came to see him on official business wait in antechambers. It wasted his time as well as theirs, and he at least had none to waste—and they had better not have. Nor were there many details of his administration that he thought he needed to keep secret, not now that those who might oppose him no longer had any place to run to. To remind his people who was boss, he occasionally kept the mayor waiting out of earshot, but everyone else came and went quite freely when he held court.

Dr. Warner and Chris sat in the rearmost benches—for Lutz's "court" was actually held in what once had been a courtroom—and waited patiently to work their way forward to the foot of the city manager's desk. In the process, the astronomer fell into a light doze; Frank Lutz's other business was nothing to him, and in addition his hearing was no better than usual for a man his age. Both Chris' curiosity and his senses, on the other hand, shared the acuity of his youth, and the latter had been sharpened by almost a lifetime of listening and watching for the rustle of small animals in the brush; and the feeling of personal danger with which Frank Lutz had filled him on their first encounter was back again, putting a razor edge upon hearing and curiosity alike.

"We're in no position to temporize," the city manager was saying.

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"This outfit is big—the biggest there is—and it's offering us a fair deal. The next time we meet it, it may not be so polite, especially if we give it any sass this time around. I'm going to talk turkey with them."

"But what do they want?" someone said. Chris craned his neck, but he did not know the man who had spoken. Most of Lutz's advisors were nonentities, in any event—except for those like Huggins, who were outright thugs.

"They want us to veer off. They've analyzed our course and say we're headed for a region of space that they'd had staked out long before we showed up. Now this, let me point out, is actually all to the good. They have a preliminary survey of the area, and we don't—everything ahead of *us* is all alike, until we've had some experience of it. Furthermore, one of the things they offer in payment is a new course which they say will take us into an iron-bearing star cluster, very recently settled, where there's likely to be plenty of work for us."

"So *they* say."

"And I believe them," Lutz said sharply. "Everything they've said to me, they've also said on the open air, by Dirac transmitter. The cops have heard every word, not only locally, but wherever in the whole universe that there's a Dirac transceiver. Big as they are, they're not going to attempt to phony an open contract. The only question in my mind is, what ought to be the price?"

He looked down at the top of his desk. Nobody seemed to have any suggestions. Finally he looked up again and smiled coldly.

"I've thought of several, but the one I like best is this: They can help us run up our supplies. We haven't got the food to reach the cluster that they've designated—I'd hoped we'd make a planetfall long before we had to go that far—but that's something that they can't know, and that I'm not going to tell them."

"They'll know when you ask for the food, Frank—"

"I'm not such an idiot. Do you think any Okie city would ever sell food at *any* price? You might as well try to buy oxygen, or money. *I'm* going to ask them to throw in some minor piece of machinery or other, it doesn't matter what, and two or three technicians to man and service it; and as an evidence of good faith, I'll offer back for these oh-so-valuable technicians a big batch of our people—people that are of no use to us. There won't be so many of them that a town *that* size would have any difficulty in absorbing them—but to us, they'll represent just the number of extra mouths to feed that would prevent us from reaching the iron-bearing cluster that Amalfi's offered to guide us to. Food will never be mentioned. It'll be just a standard swap of personnel, under the usual Okie 'rule of discretion'."

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There was a long minute of respectful silence. Even Chris was forced to admire the ingenuity of the scheme, in so far as he understood it. Frank Lutz smiled again and added:

"And this way, we get rid of every single one of those useless bums and rednecks we had to take aboard under the impressment laws. The cops will never know it; and neither will Amalfi; he has to carry enough food and, ah, medicines to maintain a crew of well over a million. He'll swallow another three hundred yokels without as much effort as you'd swallow an aspirin, and probably think it a fair trade for two technies and a machine that are useless to him. The most beautiful part of it all is, it might even *be* a fair trade . . . which brings me to my next point—"

But Chris did not stay to hear the next point. After a last, quick, regretful glance at the drowsing astronomer who had befriended him, he stole out of the court as silently as any poacher, and went to ground.

The hole was structurally an accident: Located in a warehouse at the edge of the city nearest the university, it was in the midst of an immense stack of heavy crates which evidently had shifted during the first few moments of take-off, thus forming a huge and unpredictable three-dimensional maze which no map of the city would ever show. By worrying a hole in the side of one crate with a pocketknife, Chris had found that it contained mining machinery—and, evidently, so did all the others, since they all bore the same stenciled code number. The chances were good, he thought, that the crates would not be unstacked until Scranton made its first planet-fall; the city in flight would have nothing to dig into.

Nor did Chris have any reason to leave the hole, at least for now. The warehouse itself had a toilet he could visit, and seemed to be unfrequented; and of course it didn't need a watchman—who would bother to steal heavy machinery, and where would they run with it? If he was careful not to set any fires with his candles—for the hole, although fairly well ventilated through the labyrinth, was always pitch dark—he would probably be safe until his food ran out. After that, he would have to take his chances . . . but he had been a poacher before.

But nothing in his plans had allowed for a visitor.

He heard the sounds of the approach from some distance, and blew out his candle at once. Maybe it was only a casual prowler; maybe even only a strayed child—maybe, at the worst, another refugee from Lutz's flesh-trading deal, looking for a hole. There were plenty of holes amid the piled-up crates, and the way to this one was so complex that the two of them

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could live in the heap for weeks without encountering each other . . .

But his heart sank as he realized quietly the footsteps were approaching. The newcomer was negotiating the maze with scarcely a false turn, let alone a noisy blunder.

Someone knew where he was—or at least knew where his hole was.

The footsteps became louder, slowed, and stopped. Now he could distinctly hear someone breathing.

Then the beam of a hand-torch caught him full in the face.

"Hello, Chris. Make a light, huh?"

The voice was that of Frad Haskins. Anger and relief flooded through Chris at the same time. The big man had been his first friend, and almost his name-brother—for after all, Fradley O. Haskins is not much more ridiculous a name than Crispin deFord—but that blow of light in the face had been like a betrayal.

"I've only got candles. If you'll set the flashlight on end, it'd be just as good—maybe better."

"O.K." Haskins sat down on the floor, placing the torch on the small crate Chris used for a table, so that it made a round spot of light on the boards overhead. "Now tell me something. Just what do you think you're doing?"

"Hiding," Chris said, a little sullenly.

"I can see that. I knew what this place was for the day I saw you toting books into it. I have to keep in practice on this press-gang dodge; I'll need it some day on some other planet. But in your case, what's the sense? Don't you *want* to be transferred to a bigger city?"

"No, I don't. Oh, I can't say that Scranton's been like home to me. I hate it. I wish I could really go home. But Frad, at least I'm getting to know the place. I already knew part of it, back while it was on the ground. I don't want to be kidnaped twice, and go through it all again—aboard some city where I don't know even as much about the streets as I knew about Scranton—and maybe find out that I hate it even worse. And I don't like being swapped, like . . . like a barrel of scrap."

"Well, maybe I can't blame you for that—though it's standard Okie procedure, not anything that Lutz thought up in his own head. Do you know where the 'rule of discretion' came from?"

"No."

"From the trading of players between baseball teams. It's that old—more than a thousand years. The contract law that sanctions it is supposed to be a whale of a lot older, even."

"All right," Chris said. "It could even be Roman, I suppose. But Frad, I'm not a barrel of scrap and I still don't want to be swapped."

"Now that part of it," the big man said patiently, "is just plain

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silly. You've got no future in Scranton and you ought to know it by now. On a really big town you could probably find something to do—and the least you'll get is some schooling. All our schools are closed, for good and forever. And another thing: We've only been aloft a year, and it's a cinch we've got some hard times ahead of us. An older town would be a darn sight safer—not absolutely safe, no Okie ever is; but safer."

"Are you going, too?"

Haskins laughed. "Not a chance. Amalfi must have ten thousand of the likes of me. Besides, Lutz needs me. He doesn't know it, but he does."

"Well . . . then . . . I'd rather stay with you."

Haskins smote one fist into the other palm in exasperation. "Look, Red . . . What do you say to this kid? Thanks, Chris; I . . . I'll remember that. But if I'm lucky, I'll have a boy of my own some day. This isn't the day. If you don't face facts right now, you aren't going to get a second chance. Listen, I'm the only guy who knows where you are, yet, but how long can that last? Do you know what Frank will do when he roots you out of a hole full of cached food? *Think*, please, will you?"

Chris' stomach felt as though he had just been thrown out of a window.

"I guess I never thought of that."

"You need practice. I don't blame you for that. But I'll tell you what Frank will do: *He'll have you shot*. And nobody else in town'll even raise an eyebrow. In the Okie lawbook, hoarding food comes under the head of endangering the survival of the city. Any such crime is a capital crime—and not only in Scranton, either."

There was a long silence. At last, Chris said quietly:

"All right. Maybe it is better this way. I'll go."

"That's using your head," Haskins said gruffly. "Come on, then. We'll tell Frank you were sick. You *look* sick, right enough. But we'll have to hustle—the gigs leave in two hours."

"Can I take my books?"

"They're not yours, they're Boyle Warner's," Frad said impatiently. "I'll get 'em back to him later. Pick up the torch and let's go—you'll find plenty of books where you're going." He stopped suddenly and glared at Chris. "Not that you care where you're going! You haven't even asked the name of the town."

This was true; he had not asked, and now that he came to think about it, he didn't care. But his curiosity came forward even through the gloom of the maze, and even through his despair. He said, "So I haven't. What is it?"

"New York."

IV

The sight from the gig was marvelous beyond all imagination: an

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island of towers, as tall as mountains, floating in a surfaceless, bottomless sea of stars. The gig was rocket-powered, so that Chris was also seeing the stars from space in all their jeweled majesty for the first time in his life; but the silent pride of the great human city, aloof in its spindizzy bubble—which was faintly visible from the outside—completely took precedence. Behind the gig, Scranton looked in comparison like a scuttle full of old stove-bolts.

The immigrants were met at the perimeter by a broad-shouldered, crew-cut man of about forty, in a uniform which made all of Chris' hackles rise; cops were natural enemies, here as everywhere. But the perimeter sergeant, who gave his name as Anderson, did no more than herd them all into separate cubicles for interviews.

There was nobody in Chris' cubicle but Chris himself. He was seated before a small ledge or banquette, facing a speaker grille which was set into the wall. From this there issued the questions, and into this he spoke his answers. Most of the questions were simple matters of vital statistics—his name, his age, point of origin, date of boarding Scranton and so on—but he rather enjoyed answering them; the fact was that never before in his life had anyone been interested enough in him to ask them. In fact he himself did not know the answers to some of them.

It was also interesting to speculate on the identity of the questioner. It was a machine, Chris was almost sure, and one speaking not from any vocabulary of pre-recorded words sounded by a human voice, but instead from some store of basic speech sounds which it combined and recombined as it went along. The result was perfectly understandable and nonmechanical, carrying many of the stigmata of real human speech—for example, the sentences emerged in natural speech rhythms, and with enough inflection so that key words and even punctuation could be distinguished—yet all the same he would never have mistaken it for a human voice. Whatever the difference was, he thought of it as though the device were speaking all in capital letters.

Even in an age long dominated by computers, to the exclusion, in many cases, of human beings, Chris had never heard of a machine with intelligence enough to be able to construct its speech in this fashion, let alone one intelligent enough to be given the wide discretionary latitude implied by the conduct of this interview. He had never before heard of a machine which referred to itself as "we," either.

"HOW MUCH SCHOOLING HAD YOU HAD BEFORE YOU WERE IMPRESSED, MR. DEFORD?"

"Almost none."

"DID YOU RECEIVE ANY SCHOOLING ABOARD SCRANTON?"

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"A little. Actually it was only just tutoring—the kind of thing I used to get from my father, when he felt up to it."

"IT IS RATHER LATE TO START, BUT WE CAN ARRANGE SCHOOLING FOR YOU IF YOU WISH—"

"Boy, do!"

"THAT IS THE QUESTION. AN ACCELERATED SECONDARY EDUCATION IS PHYSICALLY VERY TRYING. IT IS POSSIBLE THAT YOU WOULD HAVE NO NEED OF IT HERE, DEPENDING UPON YOUR GOALS. DO YOU WISH TO BE A PASSENGER, OR A CITIZEN?"

On the surface, this was a perfectly easy question. What Chris most wanted to do was to go home,

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and back to being a citizen of nothing more complicated than the Commonwealth of Pennsylvania, Western Common Market, Terran Confederation. He had had many bad nights spent wondering how his family was doing without him, and what they had thought of his disappearance, and he was sure that he would have many more. Yet by the same token, by now they had doubtless made whatever adjustment was possible for them to the fact of his being gone. An even more brutal fact was that he was now sitting on a metropolis of well over a million people which was floating in empty space a good twenty light-years away from Sol, bound for some destination he could not even guess. This monstrous and wonderful construct certainly was not going to turn itself into his personal Tin Cabby simply because he said he wanted to go home, or for any other reason.

So if Chris were stuck with the city, he reasoned, he might as well be a citizen. There was no point in being a passenger when he had no idea where he was going, or whether it would be worth the fare when he got there. Being a citizen, on the other hand, sounded as though it conferred some privileges; it would be worth while knowing what they were. It would also be worth knowing whether or not the two terms the machine had used carried some special technical meaning of which he ought to be wary.

"Who'm I talking to?"

"THE CITY FATHERS."

This reply nearly threw him completely off course; he tabled the baker's dozen of questions it raised only by a firm exercise of will. What was important about it right now was that it told him that he was talking to a responsible person —whatever the meaning of "person" might be when one is dealing with a machine with a collective personality.

"Am I entitled to ask questions, too?"

"YES, WITHIN LIMITS IT WOULD TAKE TOO LONG TO DEFINE FOR THE PURPOSES OF THIS INTERVIEW. IF YOU ASK US QUESTIONS, WE WILL AT PRESENT EITHER ANSWER OR NOT ANSWER."

Chris thought hard. The City Fathers, despite their mention of time limitations, waited him out without any evidence of impatience. Finally he said:

"What's the most important single difference between a passenger and a citizen?"

"A CITIZEN LIVES AN INDEFINITELY PROLONGED LIFE."

Nothing they could have said could have been farther from any answer that Chris might have expected. It was so remote from anything he had ever thought or read about that it was almost meaningless to him. Finally he managed to ask cautiously: "How long is indefinitely?"

"INDEFINITELY LONG. OUR

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PRESENT MAYOR WAS BORN IN 2998. THE AGE OF THE OLDEST CITY MAN OF WHOM WE HAVE ANY RECORD IS FIVE HUNDRED AND THIRTEEN YEARS, BUT IT IS STATISTICALLY DEFENSIBLE TO ASSUME THAT THERE ARE SEVERAL OLDER SPECIMENS, SINCE THE FIRST OF THE ANTI-DEATH DRUGS WAS DISCOVERED IN THE YEAR 2018."

Anti-death drugs! The dose was now entirely too big to swallow. It was all Chris could do to cling to the one microgram of it that seemed to have some meaning for him right now: That were he to live a long time—a very long time—he might some day find his way back home, no matter how far he had wandered in the meantime. All the rest would have to be thought through later. He said:

"I want to be a citizen."

"IT IS REQUIRED THAT WE INFORM YOU THAT YOU ARE PERMITTED TO CHANGE YOUR MIND UNTIL YOUR EIGHTEENTH BIRTHDAY, BUT THAT A DECISION TO BECOME A PASSENGER MAY NOT THEREAFTER BE RESCINDED, EXCEPT BY SPECIAL ORDER OF THE MAYOR." A thin slot which Chris had not noticed until now suddenly spat out upon the banquette a long white card. "THIS IS YOUR CITY REGISTRATION, WHICH IS USED TO OBTAIN FOOD, CLOTHING, HOUSING AND OTHER NECESSITIES. WHEN IT IS REJECTED ON PRESENTATION, YOU WILL KNOW THAT THE GOODS OR SERVICES YOU HAVE CLAIMED HAVE BEEN DISALLOWED. THE CARD IS INDESTRUCTIBLE EXCEPT BY CERTAIN SPECIAL TECHNIQUES, BUT WE ADVISE YOU NOT TO LOSE IT, SINCE FOUR TO SIX HOURS WILL ELAPSE BEFORE IT CAN BE RETURNED TO YOU. IT IS PRESENTLY VALIDATED FOR ACCELERATED SCHOOLING. IF YOU HAVE NO FURTHER QUESTIONS, YOU MAY LEAVE."

The accelerated schooling to which the City Fathers had remanded Chris did not at first seem physically strenuous at all. In fact it seemed initially to be no more demanding than sleeping all day might be. (This to Chris was a Utopian notion; he had never had the opportunity to try sleeping as a career, and so had no idea how intolerably exhausting it is.)

The "schoolroom" was a large, gray, featureless chamber devoid of blackboard or desk; its only furniture consisted of a number of couches scattered about the floor. Nor were there any teachers; the only adults present were called monitors, and their duties appeared to be partly those of an usher, and partly those of a nurse, but none pertinent to teaching in any sense of the term Chris had ever encountered. They conducted you to your couch and helped you to fit over

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your head a bright metal helmet which had inside it what seemed to be hundreds of tiny, extremely sharp points which bit into your scalp just enough to make you nervous, but without enough pressure to break the skin. Once this gadget, which was called a toposcope, was adjusted to their satisfaction, the monitors left, and the room began to fill with the gray gas.

The gas was like a fog, except that it was dry and faintly aromatic, smelling rather like the dried leaves of mountain laurel that Bob had liked to add sparingly to rabbit stews. But like a thick fog, it made it impossible to see the rest of the room until the session was over, when it was sucked out with a subdued roar of blowers.

Thus Chris could never decide whether or not he actually slept while class was in session. The teaching technique, to be sure, was called hypnopaedia, an ancient word from still more ancient Greek roots which when translated literally meant "sleep-teaching." And, to be sure, it filled your head with strange voices and strange visions which were remarkably like dreams. Chris also suspected that the gray gas not only cut off his vision, but also his other senses; otherwise he should surely have heard such random sounds as the coughing of other students, the movements of the monitors, the whir of the ventilators, the occasional deep sounds of the city's drivers, and even the beating of his own heart; but none of these came through, or if they did, he did not afterwards have any memory of them. Yet the end result of all this was almost surely not true sleep, but simply a divorcing of his mind from every possible bodily distraction which might have come between him and his fullest attention to the visions and voices which were poured directly into his mind through the shining helmet of the toposcope.

It was easy to understand why no such distraction could be tolerated, for the torrent of facts that came from the memory cells of the City Fathers into the prickly helmet was overwhelming and merciless. More than once, Chris saw ex-Scrantonites, all of them older than he was, being supported by monitors out of the classroom at the end of a session in a state closely resembling the kind of epileptic fit called *petit mal* . . . nor were they ever allowed back on their couches again. He himself left the sessions in a curious state of wobbly, washed-out detachment which became more and more marked every day, despite the tumbler of restorative drink which was the standard antidote for the gray gas; a feeling of weakness which no amount of sleep seemed to make up for.

The drink tasted funny, furthermore, and besides, it made him sneeze. But on the day after he had refused it for the first time, the memory banks decanted a double dose of projective Riemannian ge-

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ometry, and he awoke to find four monitors holding him down on the couch during the last throes of a classical Jacksonian seizure.

His education nearly stopped right there. Luckily, he had the sense to admit that he had skipped drinking the anticonvulsant drug the day before; and the records of the patterns of electrical activity of his brain which the toposcope had been taking continued to ajudge him a good risk. He was allowed back into the hall—and after that he was no longer in any doubt that learning can be harder physical labor than heaving a shovel.

The voices and the visions resumed swarming gleefully inside his aching head.

In retrospect, Chris found Okie history the least difficult subject to absorb, because the part of it dealing with the early years of the cities, and in particular with what had happened on Earth before the first of the cities had left the ground, was already familiar to him. Nevertheless he was now hearing it for the first time from the Okie point of view, which omitted great swatches which an Earthman would have considered important, and instead brought to the fore for study many events of which Chris had never heard, but which obviously were essential for the understanding of how the cities had gone into space and prospered in it. It was, perhaps predictably, like seeing the past life of the Earth through the wrong end of a telescope.

As the memory banks told the story—without the pictures and sounds and other sensations, which, though they were so vivid as to become at once a part of Chris' immediate experience, could not possibly be reproduced in print—it went like this:

"The exploration of the solar system was at first primarily the province of the military, who alone could demand the enormous sums of money necessary for space travel under rocket power, which is essentially a brute-force method of propulsion directly dependent upon how much power is thrown away. The highest achievement of this phase was the construction of a research and observation station upon Proserpina II, the second satellite of the most remote of all the planets from Sol. Proserpina Station was begun in 2016; it was, however, still not completed when it was abandoned temporarily twenty-eight years later.

"The reasons for the abandonment of Proserpina Station and all other solar system colonies at this time may be found in the course of contemporary Terrestrial politics. Under the relentless pressure of competition from the USSR and its associated states, the Earth's Western culture had undertaken to support a permanent war economy, under the burden of which its traditional libertarian political institutions were steadily eroded away. By the beginning of the Twenty-first Century it was no longer real-

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istically possible to see any difference between the rival cultures, although their outward forms of government continued to be called by different names. Both were police states in which the individual citizen had lost all right of juridical defense, and both operated under a totally controlled economy. In the West, the official term for this form of public policy was 'anti-Communism;' in the East it was called 'anti-Fascism,' and both terms were heavily laden with mob emotion. The facts of the matter, however, were that neither state was economically either fascist or communist, and that as economic systems neither fascism nor communism has ever been tried in recorded Terrestrial history.

"It was during this period that two Western research projects under the direction of the Alaskan senator Bliss Wagoner discovered the basic inventions upon which the second phase of spaceflight was to be based. The first of these was the Dillon-Wagoner graviton-polarity generator, now known as the spindizzy, which was almost immediately developed into an interstellar drive. The second was ascomycin, the first of the anti-agathics, or death-postponing drugs. The first interstellar expedition was launched from the Jovian satellary system in 2021 under Wagoner's personal direction, although Wagoner himself was arrested and executed for his complicity in this 'treasonable' event. Though no record exists of the fate of this expedition, it is certain that it survived, since the second expedition, more than three hundred and fifty years later, found the planets of the stars of the local group well scattered with human beings speaking recognizable Terrestrial languages.

"At this time an attempt was made to settle the rivalry between the two power blocs by still another personal pact between their respective leaders, President MacHinery of the Western Common Market and Premier Erdsenov of the USSR. This took place in 2022, and the subsequent Cold Peace provided little incentive for spaceflight. In 2027 MacHinery was assassinated, and Erdsenov proclaimed himself premier and president of a United Earth; however, Erdsenov was himself assassinated in 2032. During this same year, an underground Western group calling itself the Hamiltonians succeeded in escaping from the solar system in a large number of small spindizzy-powered craft which they had built from funds collected secretly to finance a supposed new American revolution, thus leaving behind the vast majority of their followers. No survivors of the Hamiltonian exodus have thus far been found; they succeeded, however, in escaping the Terror, the world-wide program by which a united Earth government was actually established for the first time.

"One of the first acts of this gov-

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ernment, now called the Bureaucratic State, was the banning in 2039 of spaceflight and all associated sciences. The existing colonies on the planets and satellites of the solar system were not evacuated home, but were simply cut off and abandoned. The consolidation of the State proceeded rapidly, and historians generally agree that the fall of the West must be dated no later than the year 2105. Thus began a period of systematic oppression and exploitation unmatched on Earth even by the worst decades of the Roman Empire.

"In the meantime the interstellar exiles continued to consolidate new planets and to jump from star to star. In 2289, one such expedition made its first contact with what proved to be a planet of the Vegan Tyranny, an interstellar culture which, we now know, had ruled most of this quadrant of the galaxy for eight to ten thousand years, and was still in the process of expanding. The Vegans were quick to see potential rivals even in these unorganized and badly supplied colonists, and made a concerted attempt to stamp out all the colonies. However, the distances involved were so vast that the first real engagement of the Vegan War, the battle of Altair, did not occur until 2310. The colonial forces were defeated and scattered, but not before inflicting sufficient damage to set back the Vegans' timetable for razing the colonial planets—permanently, as it turned out.

"In 2375, the spindizzy was independently re-discovered on Earth and the Thorium Trust's Plant No. Eight used it to wrench its entire installation free of the ground and leave the Earth, using the plant as a self-contained spaceship. Other plants followed, and shortly thereafter, whole cities. Many of these were driven to leave as much by the permanent depression which had settled over the Earth as by the long-established political repressions of the Bureaucratic State. Those escaping cities quickly found the earlier Earth colonies among the nearby stars, to which they provided badly needed industrial strength, and with whom they joined forces against Vega. The outcome was both triumphant and shameful. In 2394 one of the escaping cities, Gravitogorsk-Mars, now calling itself the Interstellar Master Traders, was responsible for the sacking of the new Earth colony on Thor V; this act of ferocity earned for them the nickname of 'the Mad Dogs,' but it gradually became a model for dealing with Vegan planets. The capitol world of the Tyranny, Vega II, was invested in 2413 by a number of armed cities, including IMT, whose task it was to destroy the many orbital forts surrounding the planet, and by the Third Colonial Navy under Admiral Alois Hrunta, who was charged with occupying Vega II in the event of its surrender. Instead, Admiral Hrunta scorched the planet completely, and led the Third Navy

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off into an uncharted quadrant with the intention of founding his own interstellar empire. In 2451 the colonial court found him guilty *in absentia* of atrocities and attempted genocide, and an attempt to bring him to justice culminated in 2464 in the battle of BD 40°4048′, which was destructive but completely indecisive for both sides. The same year Alois Hrunta declared himself Emperor of Space.

"The exodus of Earth's industrial power had by now become so marked that the Bureaucratic State no longer had a productive base upon which to rest, and it is generally agreed that it collapsed in 2522. In the same year there began the police interregnum, a limited government deriving its powers from a loose confederation based roughly upon the ancient United Nations, but without sufficient popular base or industrial support to control the economy. Realizing, however, that the only hope for the restoration of economic health to Earth lay in the colonists and the free cities, the confederation proclaimed an amnesty for everyone in space, and at the same time instituted a limited but systematic program for the policing of those nomad cities which had begun to prey upon colony planets or upon each other.

"The confederation is still the only operative government in this arm of the galaxy. The poisoning of Alois Hrunta in 3089 was followed by the rapid balkanization of the Hruntan Empire, which was never even at its best highly cohesive, and although there is a present self-styled Emperor of Space, Arpad Hrunta, his realm does not appear to be of any importance. Effectively, today, law and order in Arm II are provided by the Earth police, and its economy is supported by the migrant cities. Both systems are haphazard and inefficient, and often operate at cross purposes.

"It is impossible to predict when better methods will emerge, or what they will be."

V

While the memory cells chattered and called up dreams, the immense city soared outward among the stars, at what seemed like a breakneck pace after the tentative first explorations of Scranton within the local group. The streets were thronged twenty-four hours a day with myriads of people hurrying on unimaginable errands; and in addition to the constant flitting of Tin Cabs, there was often the distant, but edgy, roar of subway trains coursing through tunnels bored through the very granite keel of the city. All of this activity seemed purposeful and even cheerful, but it was also extremely bewildering.

Chris' schooling left him very little time to explore it. Not all of his education was machine education, either, for, as he slowly realized, no one really *learns* any-

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thing through hypnopaedia; machine teaching at its best enables the student to accumulate nothing better than facts; it does not show how to tie them together, let alone how to do something with them. To train the intelligence—not just the memory—a real human tutor is required.

The one assigned to Chris, a stocky, fierce, white-haired woman named Dr. Helena Braziller, was far and away the best teacher Chris had ever encountered in his life—and far and away the worst taskmaster. The City Fathers wore him out only by taxing his memory; whereas Dr. Braziller made him *work:*

"The fundamental equation of the Blackett-Dirac scholium reads as follows:

$$P = \frac{BG^{\frac{1}{2}}U}{2C}$$

where P is magnetic moment, U is angular momentum, C and G have their usual values, and B is a constant with the value 0.25 approximately. A first transform of this identity gives:

$$G = \left(\frac{2PC}{BU}\right)^2$$

Which is the usual shorthand form of the primary spindizzy equation, called the Locke Derivation. Blackett, Dirac and Locke all assumed that it would hold true for large bodies, such as gas-giant planets and suns. Show on the blackboard by dimensional analysis why this assumption is invalid."

As far as Chris was concerned, the answer could have been much more simply arrived at; Dr. Braziller could just have told him that this relationship between gravitation and the spin of a body applied only to electrons and other submicroscopic objects, and disappeared, for all practical purposes, in the world of the macrocosm; but that was not her way. Had she only told him that, it would have come into his mind as a fact like any other fact—for instance, like the facts that the memory cells of the City Fathers were constantly pouring into his ears and eyes—but by her lights he would not have understood it. She wanted him to repeat not only the original reasoning of Blackett, Dirac and Locke, but to see for himself, not just because she told him so, where they had gone astray, and hence why a natural law which had first been proposed in the gas-lit, almost prehistoric year of 1891, and was precisely formulated as the 'Lande Factor in 1940, nevertheless failed to lift so much as a grain of sand off the Earth until the year 2019.

"But Dr. Braziller, why isn't it enough to see that they made a mistake? We know that now. Why repeat it?"

"Because that's what all these great men have labored toward: so that you could do it right, yourself. Up until about the Thirteenth Century, nobody in the world except a few dedicated scholars could do long division; then Fibo-

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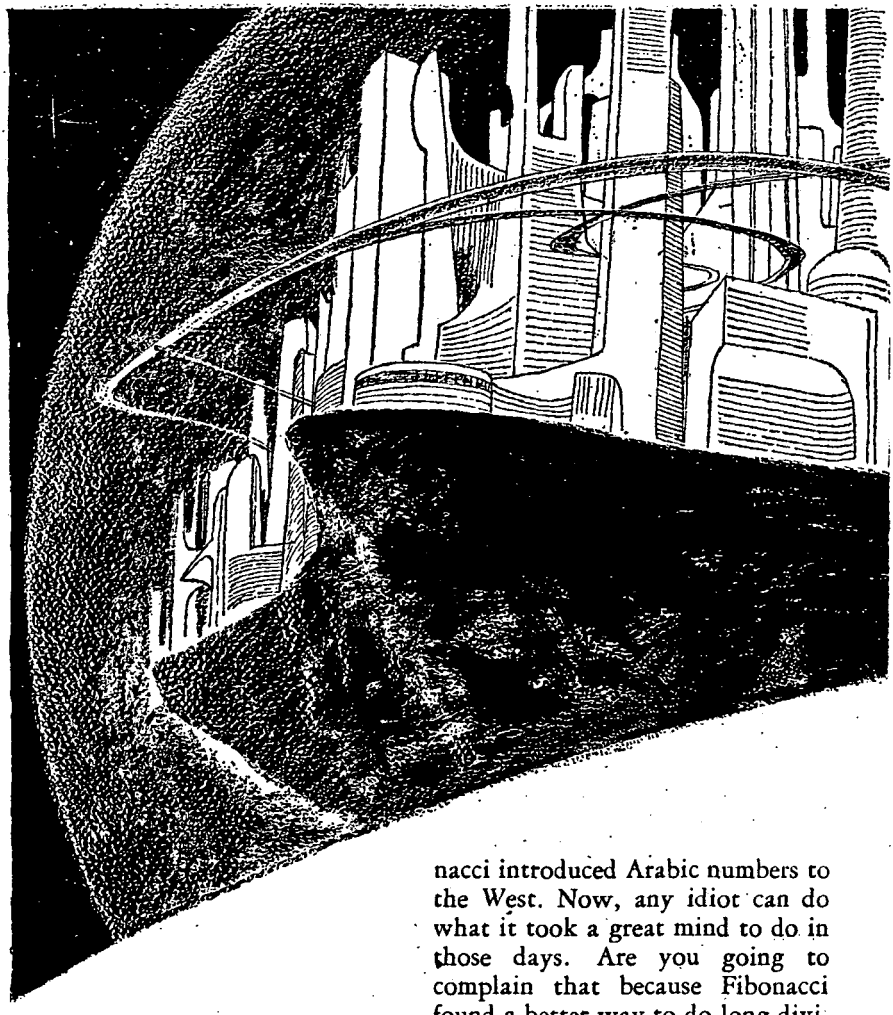

nacci introduced Arabic numbers to the West. Now, any idiot can do what it took a great mind to do in those days. Are you going to complain that because Fibonacci found a better way to do long division, you shouldn't be required to learn why it's better? Or that because a great inventor like Locke didn't understand dimensional analysis, you should be allowed to be just as ignorant, after all these years? They spent their lives mak-

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ing things simple for you that were enormously difficult for them, and until you understand the difficulties, you can't possibly understand the simplifications. Go back to the blackboard and try again."

Being in a "live" class had its compensations, though; and one of these was Piggy Kingston-Throop. Piggy—his real name was George, but nobody ever called him that, not even Dr. Braziller—was not much of a prize as a friend and companion, but he was the only member of the small class who was exactly Chris' age; all the others were much younger. From this Chris deduced that Piggy was not a student, which turned out to be true.

Piggy seemed glad enough to encounter someone who was as retarded as he was, regardless of the reasons, and who knew less than he did about a great many

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subjects which were commonplaces to him. And in many ways he was quite a pleasant sort of fellow: blond, plump and affable, with a ready wit and a tendency to be unimpressed by almost everything that other people considered important. In this last, he made a particularly good foil for Chris, who in his ignorance and in the strangeness of his situation often could not help but be earnest to the point of grimness over what later turned out to be trivia.

Not that Chris allowed these differences over value-judgments always to be resolved in Piggy's favor; they quarreled over them almost from the beginning. The first of these tangles, which soon proved to be a model for the others, involved the subject of the anti-agathic drugs.

"You're going to be a citizen, aren't you, Piggy?"

"Oh, sure. I'm all set."

"I wish I were My trouble is, I don't even know what I want to do—let alone what I'm good at."

Piggy turned and stared at him. They had paused on the way from school on the Tudor Tower Place bridge leading over Forty-second Street. Long ago, the view from here across First Avenue to the East River had been blocked by the UN Building, but that had been demolished during the Terror, and there was nothing to mark where it had stood but a plaza; and on the far side of that, starry space itself.

"What do you mean, *do?*" Piggy said. "Oh, maybe you'll have a little trouble, what with not having been born here. But there're ways around that. Don't believe everything they tell you."

Like many of the things Piggy said, fully eighty per cent of this speech meant nothing to Chris. In self-defense, he could do nothing but answer the question. "You know all this better than I do. But the laws do say pretty clearly that a man has to be good for something before he's allowed to become a citizen, and be started on the drug treatments. Let's see; there are supposed to be three ways to go about it; and I ought to have them straight, because I just had them put into my head a few days ago."

He concentrated a moment. He had discovered a useful trick for dredging up the information which had been implanted in his mind from the memory cells: If he half closed his eyes and imagined the gray gas, in a moment he would begin to feel at least in retrospect the same somnolence under which the original facts had been imparted, and it would come back in very much the same words. It worked equally well this time; almost at once, he heard his own voice saying, in a curious monotone imitation of the City Fathers:

" 'There are three general qualifications for citizenship. They are: 1. Display of some obviously useful talent, such as computer programming, administration, or an-

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other gift worth retaining, as opposed to depending upon the accidents of birth to provide new such men for each succeeding generation; 2. a demonstrable bent toward any intellectual field, including scientific research, the arts and philosophy, since in these fields one lifetime is seldom enough to attain masterhood, let alone put it to the best use; and 3. passage of the Citizenship Tests, which are designed to reveal reserves and potentials in the late-maturing eighteen-year-old whose achievement record is unimpressive.' No matter how you slice it, it doesn't sound easy!"

"That's only what the City Fathers say," Piggy said scornfully. "What do they know about it? They're only a bunch of machines. They don't know anything about people. Those rules don't even make sense."

"They make sense to me," Chris objected. "It's a cinch the anti-agathics can't be given to everybody—from what I hear, they're scarcer than germanium. On Scranton, the big boss wouldn't even allow them to be mentioned in public. So there's got to be *some* way of picking who gets them and who doesn't."

"Why?"

"Why? Well, to begin with, because a city is like an island—an island in the middle of the biggest ocean you can think of, and then some. Nobody can get on, and nobody can get off, except for a couple of guys now and then. If everybody gets the drugs and lives forever, pretty soon the place is going to be so crowded that we'll all be standing on each other's feet."

"Ah, cut it out. Look around you. Are *we* all standing on each other's feet?"

"No, but that's because the drugs are restricted, and because not everybody's allowed to have children, either. For that matter, look at you, Piggy—your father and your mother are both big wheels on this town, but you're an only child, and furthermore, the first one they've been allowed to have in a hundred and fifty years."

"Leave them out of this," Piggy growled. "They didn't play their cards right, I'll tell you that. But that's none of your business."

"All right. Take me, then. Unless I turn out to be good for something before I'm eighteen—and I can't think what it would be—I won't be a citizen and I won't get the drugs. Or even if I do get to be a citizen, say by passing the Tests, I'll still have to prove myself useful stock before I'm allowed to have even one kid of my own. That's just the way it has to be when the population has to be kept stable; it's simple economics, Piggy, and there's a subject I think I know something about."

Piggy spat reflectively over the railing, though it was hard to tell whether or not he was expressing

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an opinion, and if so, whether it referred to economics alone or to the entire argument. "All right, then," he said. "Suppose you get the drugs, and they let you have a kid. Why shouldn't they give the kid the drugs, too?"

"Why should they, unless he qualifies?"

"Boy, you *are* dumb! That's what the Citizenship Tests are for, can't you see that? They're an out—an escape hatch—a dodge—and that's all they are. If you don't get in any other way, you get in that way. At least you do if you've got any sort of connections. If you're a nobody, maybe the City Fathers rig the Tests against you—that's likely enough. But if you're a somebody, they're not going to be too tough. If they are, my father can fix their wagon—he programs 'em. But either way, there's no way to study for the Tests, so they're obviously a sell."

Chris was shaken, but he said doggedly: "But they're not supposed to be that kind of test at all. I mean, they're not supposed to show whether or not you're good at dimensional analysis, or history, or some other subject. They're supposed to show up gifts that you were born with, not anything that you got through schooling or training."

"Spindizzy whistle. A test you can't study for is a test you can't pass unless it's rigged—otherwise it doesn't make any sense at all. Listen, Red, if you're so sold on this idea that everybody who gets to take the drugs has to be a big brain, what about the guardian they handed you over to? He's got no kids of his own, and he's nothing but a cop . . . but he's almost as old as the Mayor!"

Up to now, Chris had felt vaguely that he had been holding his own; but this was like a blow in the face.

Chris had originally been alarmed to find that his ID card assigned him lodgings with a family, and horrified when the assignment number turned out to belong to Sgt. Anderson. His first few weeks in the Andersons' apartment—it was in the part of the city once called Chelsea—were prickly with suspicion, disguised poorly by as much formality as his social inexperience would allow.

It soon became impossible, however, to continue believing that the perimeter sergeant was an ogre; and his wife, Carla, was as warm and gracious a woman as Chris had ever met. They were childless, and could not have welcomed Chris more wholeheartedly had he been one of their own. Furthermore, as the City Fathers had of course calculated, Anderson was the ideal guardian for a brand-new young passenger, for few people, even the Mayor, knew the city better.

He was, in fact, considerably more than a cop, for the city's police force was also its defense force—and its Marines, should the need

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for a raid or a boarding party ever arise. Technically, there were many men on the force who were superior to the perimeter sergeant, but Anderson and one counterpart, a dark, taciturn man named Dulany, headed picked squads and were nearly independent of the rest of the police, reporting directly to Mayor Amalfi.

It was this fact which opened the first line of friendly communication between Chris and his guardian. He had not yet even seen Amalfi with his own eyes. Although everyone in the city spoke of him as if they knew him personally, here at last was one man who really did, and saw him several times a week. Chris was unable to restrain his curiosity.

"Well, that's just the way people talk, Chris. Actually hardly anyone sees much of Amalfi, he's got too much to do. But he's been in charge here a long time and he's good at his job; people feel that he's their friend because they trust him."

"But what is he *like*?"

"He's complicated—but then most people are complicated, I guess the word I'm groping for is 'devious.' He sees connections between events that nobody else sees. He sizes up a situation like a man looking at a coat for the one thread that'll make the whole thing unravel. He has to—he's too burdened to deal with things on a stitch-by-stitch basis. In my opinion he's killing himself with overwork as it is."

It was to this point that Chris returned after his upsetting argument with Piggy. "Sergeant, the other day you said that the Mayor was killing himself with overwork. But the City Fathers told me he's several centuries old. On the drugs, he ought to live forever, isn't that so?"

"Absolutely not," Anderson said emphatically. "*Nobody* can live forever. Sooner or later, there'd be an accident, for one thing. And strictly speaking, the drugs aren't a 'cure' for death anyhow. Do you know how they work?"

"No," Chris admitted. "School hasn't covered them yet."

"Well, the memory banks can give you the details—I've probably forgotten most of them. But generally, there are several anti-agathics, and each one does a different job. The main one, ascomycin, stirs up a kind of tissue in the body called the reticulo-endothelial system—the white blood corpuscles are a part of it—to give you what's called 'non-specific immunity.' What that means is that for about the next seventy years, you can't catch any infectious disease. At the end of that time you get another shot, and so on. The stuff isn't an antibiotic, as the name suggests, but an endotoxin fraction—a complex organic sugar called a mannose; it got its name from the fact that it's produced by fermentation, as antibiotics are.

"Another is TATP—triacetyltriparanol. What this does is inhibit

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the synthesis in the body of a fatty stuff called cholesterol; otherwise it collects in the arteries and causes strokes, apoplexy, high blood pressure and so on. This drug has to be taken every day, because the body goes right on trying to make cholesterol every day."

"Doesn't that mean that it's good for something?" Chris objected tentatively.

"Cholesterol? Sure it is. It's absolutely essential in the development of a fetus, so women have to lay off TATP while they're carrying a child. But it's of no use to men—and men are far more susceptible to circulatory diseases than women.

"There are still two more antiagathics in use now, but they're minor; one, for instance, blocks the synthesis of the hormone of sleep, which again is essential in pregnancy but a thundering nuisance otherwise; that one was originally found in the blood of ruminant animals like cows, whose plumbing is so defective that they'd die if they lay down."

"You mean you *never sleep*?"

"Haven't got the time for it," Anderson said gravely. "Or the need any longer, thank goodness. But ascomycin and TATP between them prevent the two underlying major causes of death: heart disease and infections. If you prevent those alone, you extend the average lifetime by at least two centuries.

"But death is still inevitable, Chris. If there isn't an accident, there may be cancer, which we can't prevent yet . . . oh, ascomycin attacks tumors so strongly that cancer doesn't kill people any longer, in fact the drug even offers quite a lot of protection against hard radiation; but cancer can still make life so agonizing that death is the only humane treatment. Or a man can die of starvation, or of being unable to get the antiagathics. Or he can die of a bullet—or of overwork. We live long lives in the cities, sure; *but there is no such thing as immortality*. It's as mythical as the unicorn. Not even the universe itself is going to last forever."

This, at last, was the opportunity Chris had been hoping for, though he still hardly knew how to grasp it.

"Are . . . are the drugs ever stopped, once a man's been made a citizen?"

"Deliberately? I've never heard of such a case," Anderson said, frowning. "Not on our town. If the City Fathers want a man dead, they shoot him. Why let him linger for the rest of his seventy-year stanza? That would be outrageously cruel—what would be the reason for such a procedure?"

"Well, no tests are foolproof. I mean, supposing they make a man a citizen, and then discover that he really isn't . . . uh . . . as big a genius as they thought he was?"

The perimeter sergeant looked at Chris narrowly, and there was quite a long silence, during which Chris

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could clearly hear the pulsing of his own blood in his temples. At last Anderson said slowly:

"I see. It sounds to me like somebody's been feeding you spindizzy whistle. Chris, if only geniuses could become citizens, how long do you think a city could last? The place'd be depopulated in one crossing. That isn't how it works at all. The whole reason for the drugs is to save skills—and it doesn't matter one bit what the skills are. All that matters is whether or not it would be logical to keep a man on, rather than training a new one every four or five decades.

"Take me for an example, Chris. I'm nobody's genius, I'm only a boss cop. But I'm good at my job, good enough so that the City Fathers didn't see any reason to bother raising and training another one from the next generation; they kept this one, which is me; but a cop is all I am. Why not? It suits me, I like the work, and when Amalfi needs a boss cop he calls me or Dulany—not any officer on the force, because none of them have the scores of years of experience at this particular job that we do under their belts.

"When the Mayor wants a perimeter sergeant he calls me; when he wants a boarding squad he calls Dulany; and when he wants a genius, he calls a genius. There's one of everything on board this town—partly because it's so big—and so long as the system works, no need for more than one. Or more than X, *X* being whatever number you need."

Chris grinned. "You seemed to remember the details all right."

"I remembered them all," Anderson admitted. "Or all that they gave me. Once the City Fathers put a thing into your head, it's hard to get rid of."

As he spoke, there was a pure fluting sound, like a brief tune, somewhere in the apartment. The perimeter sergeant's heavy head tipped up; then, he too grinned.

"We're about to have a demonstration," he said. He was obviously pleased. He touched a button on the arm of his chair.

"Anderson?" a heavy voice said. Chris thought instantly that the father bear in the ancient myth of Goldilocks must have sounded much like that.

"Yes . . . here, sir."

"We're coming up on a contract. It looks fairly good to me and the City Fathers, and I'm about to sign it. Better come up here and familiarize yourself with the terms, just in case. This'll be a rough one, Joel."

"Right away." Anderson touched the button, and his grin became broader and more boyish than ever.

"The Mayor!" Chris burst out.

"Yep."

"But what did he mean?"

"That he's found some work for us to do. Unless there's a hitch, we should be landing in just a few days."

To be concluded

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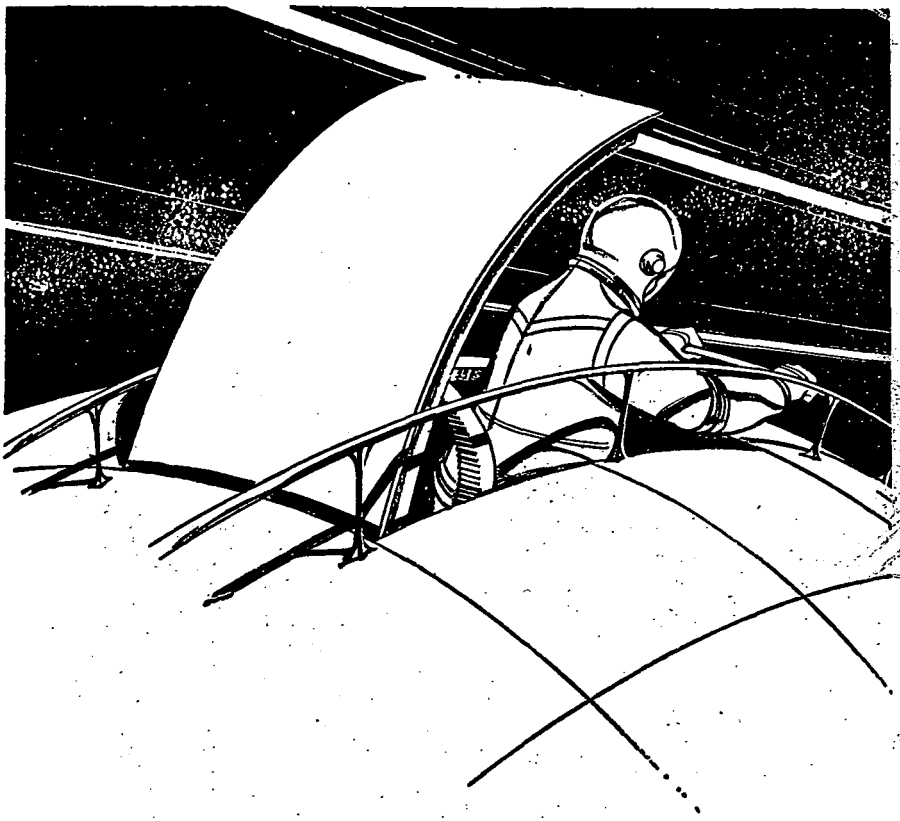

The Winds of Time

He contracted for a charter trip—
but the man who hired his spacer wasn't quite a man,
it turned out—and he wanted more than service!

by James H. Schmitz

Illustrated by Brotman

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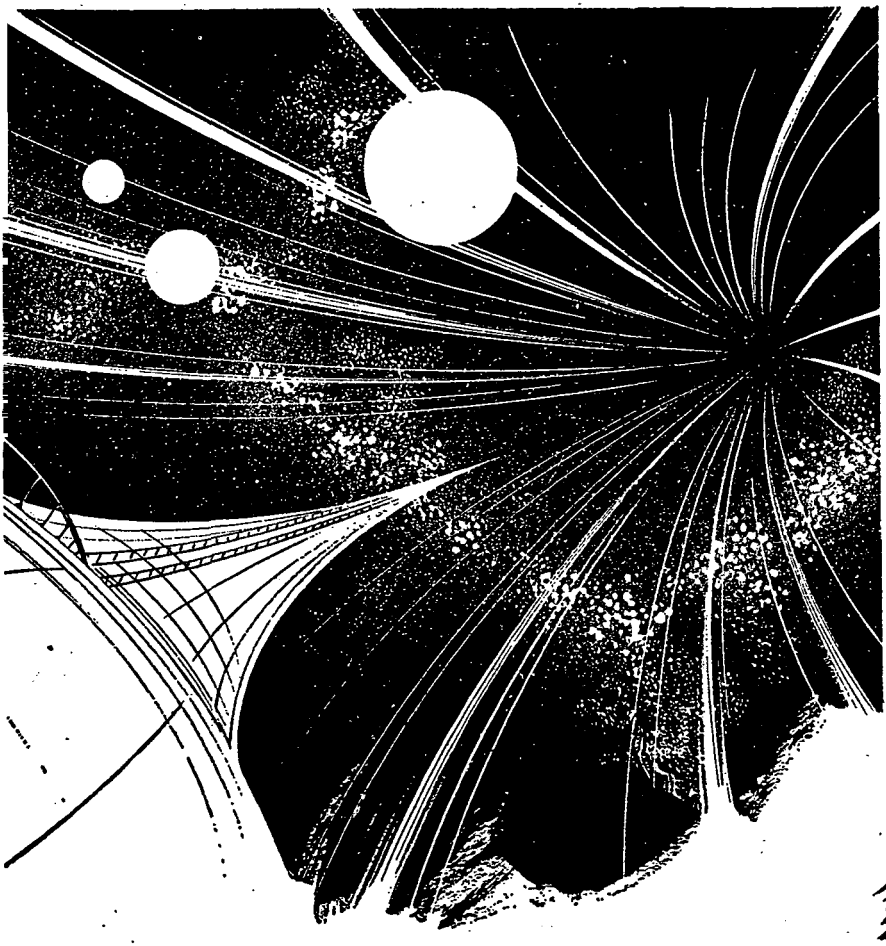

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■ Gefty Rammer came along the narrow passages between the *Silver Queen's* control compartment and the staterooms, trying to exchange the haggard look on his face for one of competent self-assurance. There was nothing to gain by letting his two passengers suspect that during the past few minutes their pilot, the owner of Rammer Spacelines, had been a bare step away from plain and fancy gibbering.

He opened the door to Mr. Maulbow's stateroom and went inside. Mr. Maulbow, face very pale, eyes closed, lay on his back on the couch, still unconscious. He'd been knocked out when some unknown forces suddenly started batting the *Silver Queen's* turnip shape around as the *Queen* had never been batted before in her eighteen years of spacefaring. Kerim Ruse, Maulbow's secretary, knelt beside her employer, checking his pulse. She looked anxiously up at Gefty.

"What did you find out?" she asked in a voice that was not very steady.

Gefty shrugged. "Nothing definite as yet. The ship hasn't been damaged—she's a tough tub. That's one good point. Otherwise . . . well, I climbed into a suit and took a look out the escape hatch. And I saw the same thing there that the screens show. Whatever that is."

"You've no idea then of what's happened to us, or where we are?" Miss Ruse persisted. She was a rather small girl with large, beautiful gray eyes and thick blue-black hair. At the moment, she was barefoot and in a sleeping outfit which consisted of something soft wrapped around her top, soft and floppy trousers below. The black hair was tousled and she looked around fifteen. She'd been asleep in her stateroom when something smacked the *Queen,* and she was sensible enough then not to climb out of the bunk's safety field until the ship finally stopped shuddering and bucking about. That made her the only one of the three persons aboard who had collected no bruises. She was scared, of course, but taking the situation very well.

Gefty said carefully, "There're a number of possibilities. It's obvious that the *Queen* has been knocked out of normspace, and it may take some time to find out how to get her back there. But the main thing is that the ship's intact. So far, it doesn't look too bad."

Miss Ruse seemed somewhat reassured. Gefty could hardly have said the same for himself. He was a qualified normspace and subspace pilot. He had put in a hitch with the Federation Navy, and for the past eight years he'd been ferrying his own two ships about the Hub and not infrequently beyond the Federation's space territories, but he had never heard of a situation like this. What he saw in the viewscreens when the ship steadied enough to let him pick himself off the instrument room floor, and again, a few minutes later and with much more immediacy, from the escape hatch, made no sense—seemed simply to have no meaning. The pressure meters said there was a vacuum outside the *Queen's* skin. That

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vacuum was dark, even pitch-black but here and there came momentary suggestions of vague light and color. Occasional pinpricks of brightness showed and were gone. And there had been one startling phenomenon like a distant, giant explosion, a sudden pallid glare in the dark, which appeared far ahead of the *Queen* and, for the instant it remained in sight, seemed to be rushing directly towards them. It had given Gefty the feeling that the ship itself was plowing at high speed through this eerie medium. But he had cut the *Queen's* drives to the merest idling pulse as soon as he staggered back to the control console and got his first look at the screens, so it must have been the light that had moved.

But such details were best not discussed with a passenger. Kerim Ruse would be arriving at enough disquieting speculations on her own; the less he told her, the better. There was the matter of the ship's location instruments. The only set Gefty had been able to obtain any reading on were the direction indicators. And what they appeared to indicate was that the *Silver Queen* was turning on a new heading something like twenty times a second.

Gefty asked, "Has Mr. Maulbow shown any signs of waking up?"

Kerim shook her head. "His breathing and pulse seem all right, and that bump on his head doesn't look really bad, but he hasn't moved at all. Can you think of anything else we might do for him, Gefty?"

"Not at the moment," Gefty said. "He hasn't broken any bones. We'll see how he feels when he comes out of it." He was wondering about Mr. Maulbow and the fact that this charter had showed some unusual features from the beginning.

Kerim was a friendly sort of girl; they'd got to calling each other by their first names within a day or two after the trip started. But after that, she seemed to be avoiding him; and Gefty guessed that Maulbow had spoken to her, probably to make sure that Kerim didn't let any of her employer's secrets slip out.

Maulbow himself was as aloof and taciturn a client as Rammer Spacelines ever had picked up. A lean, blond character of indeterminate age, with pale eyes, hard mouth. Why he had selected a bulky semi-freighter like the *Queen* for a mineralogical survey jaunt to a lifeless little sun system far beyond the outposts of civilization was a point he didn't discuss. Gefty, needing the charter money, had restrained his curiosity. If Maulbow wanted only a pilot and preferred to do all the rest of the work himself, that was certainly Maulbow's affair. And if he happened to be up to something illegal—though it was difficult to imagine what—Customs would nail him when they got back to the Hub.

But those facts looked a little different now.

Gefty scratched his chin, inquired, "Do you happen to know where Mr. Maulbow keeps the keys to the storage vault?"

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Kerim looked startled. "Why, no! I couldn't permit you to take the keys anyway while he . . . while he's unconscious! You know that."

Gefty grunted. "Any idea of what he has locked up in the vault?"

"You shouldn't ask me—" Her eyes widened. "Why, that couldn't possibly have anything to do with what's happened!"

He might, Gefty thought, have reassured her a little too much. He said, "I wouldn't know. But I don't want to just sit here and wonder about it until Maulbow wakes up. Until we're back in normspace, we'd better not miss any bets. Because one thing's sure—if this has happened to anybody else, they didn't turn up again to report it. You see?"

Kerim apparently did. She went pale, then said hesitantly, "Well . . . the sealed cases Mr. Maulbow brought out from the Hub with him had some very expensive instruments in them. That's all I know. He's always trusted me not to pry into his business any more than my secretarial duties required, and of course I haven't."

"You don't know then what it was he brought up from that moon a few hours ago—those two big cases he stowed away in the vault?"

"No, I don't, Gefty. You see, he hasn't told me what the purpose of this trip is. I only know that it's a matter of great importance to him." Kerim paused, added, "From the careful manner Mr. Maulbow handled the cases with the cranes, I had the impression that whatever was inside them must be quite heavy."

"I noticed that," Gefty said. It wasn't much help. "Well, I'll tell *you* something now," he went on. "I let your boss keep both sets of keys to the storage vault because he insisted on it when he signed the charter. What I didn't tell him was that I could make up a duplicate set any time in around half an hour."

"Oh! Have you—?"

"Not yet. But I intend to take a look at what Mr. Maulbow's got in that vault now, with or without his consent. You'd better run along and get dressed while I take him up to the instrument room."

"Why move him?" Kerim asked.

"The instrument room's got an overall safety field. I've turned it on now, and if something starts banging us around again, the room will be the safest place on the ship. I'll bring his personal luggage up too, and you can start looking through it for the keys. You may find them before I get a new set made. Or he may wake up and tell us where they are."

Kerim Ruse gave her employer a dubious glance, then nodded, said, "I imagine you're right, Gefty," and pattered hurriedly out of the stateroom. A few minutes later, she arrived, fully dressed, in the instrument room. Gefty looked around from the table-shelf where he had laid out his tools, and said, "He hasn't stirred. His suitcases are over there. I've unlocked them."

Kerim gazed at what showed in the screens about the control console and shivered slightly. She said, "I was thinking, Gefty . . . isn't there some-

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thing they call Space Three?"

"Sure. Pseudospace. But that isn't where we are. There're some special-built Navy tubs that can operate in that stuff if they don't stay too long. A ship like the *Queen* . . . well, you and I and everything else in here would be frozen solid by now if we'd got sucked somehow into Space Three."

"I see," Kerim said uncomfortably. Gefty heard her move over to the suitcases. After a moment, she asked. "What do the vault keys look like?"

"You can't miss them if he's just thrown them in there. They're over six inches long. What kind of a guy is this Maulbow? A scientist?"

"I couldn't say, Gefty. He's never referred to himself as a scientist. I've had this job a year and a half. Mr. Maulbow is a very considerate employer . . . one of the nicest men I've known, really. But it was simply understood that I should ask no questions about the business beyond what I actually needed to know for my work."

"What's the business called?"

"Maulbow Engineering."

"Big help," Gefty observed, somewhat sourly. "Those instruments he brought along . . . he build those himself?"

"No, but I think he designed some of them—probably most of them. The companies he had doing the actual work appeared to have a terrible time getting everything exactly the way Mr. Maulbow wanted it—There's nothing that looks like a set of keys in those first two suitcases, Gefty."

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"Well," Gefty said, "if you don't find them in the others, you might start thumping around to see if he's got secret compartments in his luggage somewhere."

"I do wish," Kerim Ruse said uneasily, "that Mr. Maulbow would regain consciousness. It seems so . . . so underhanded to be doing these things behind his back!"

Gefty grunted noncommitally. He wasn't at all certain by now that he wanted his secretive client to wake up before he'd checked on the contents of the *Queen's* storage vault.

Fifteen minutes later, Gefty Rammer was climbing down to the storage deck in the *Queen's* broad stern, the newly fashioned set of vault keys clanking heavily in his coat pocket. Kerim had remained with her employer who was getting back his color but still hadn't opened his eyes. She hadn't found the original keys. Gefty wasn't sure she'd tried too hard, though she seemed to realize the seriousness of the situation now. But her loyalty to Mr. Maulbow could make no further difference, and she probably felt more comfortable for it.

Lights went on automatically in the wide passage leading from the cargo lock to the vault as Gefty turned into it. His steps echoed between the steel bulkheads on either side. He paused a moment before the big circular vault doors, listening to the purr of the *Queen's* idling engines in the next compartment. The familiar sound was somehow reassuring. He inserted the first key, turned it over twice, drew it out again and pressed one of the buttons in the control panel beside the door. The heavy slab of steel moved sideways with a soft, hissing sound, vanished into the wall. Gefty slid the other key into the lock of the inner door. A few seconds later, the vault entrance lay open before him.

He stood still again, wrinkling his nose. The area ahead was only dimly illuminated—the shaking-up the *Queen* had undergone had disturbed the lighting system here. And what was that odor? Rather sharp, unpleasant; it might have been spilled ammonia. Gefty stepped through the door into the wide, short entrance passage beyond it, turned to the right and peered about in the semidarkness of the vault.

Two great steel cases—the ones Maulbow had taken down to an airless moon surface, loaded up with something and brought back to the *Queen*—were jammed awkwardly into a corner, in a manner which suggested they'd slid into it when the ship was being knocked around. One of them was open and appeared to be empty. Gefty wasn't sure of the other. In the dimness beside them lay the loose coils of some very thick, dark cable—And standing near the center of the floor was a thing that at once riveted his attention on it completely. He sucked his breath in softly, feeling chilled.

He realized he hadn't really believed his own hunch. But, of course, if it hadn't been an unheard-of out-

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side force that plucked the *Queen* out of normspace and threw her into this elsewhere, then it must be something Maulbow had put on board. And that something had to be a machine of some kind—

It was.

About it he could make out a thin gleaming of wires—a jury-rigged safety field. Within the flimsy-looking protective cage was a double bank of instruments, some of them alive with the flicker and glow of lights. Those must be the very expensive and difficult-to-build items Maulbow had brought out from the Hub. Beside them stood the machine, squat and ponderous. In the vague light, it looked misshaped and discolored. A piece of equipment that had taken a bad beating of some kind. But it was functioning. As he stared, intermittent bursts of clicking noises rose from it, like the staccato of irregular gunfire.

For a moment, questions raced in disorder through his mind. What was it? Why had it been on that moon? Part of another ship, wrecked now . . . a ship that had been at home *here?* Was it some sort of drive?

Maulbow must know. He'd known enough to design the instruments required to bring the battered monster back to life. On the other hand, he had not foreseen in all detail what could happen once the thing was in operation, because the *Queen's* sudden buck-jumping act had surprised him and knocked him out.

The first step, in any event, was to get Maulbow awake now. To tamper with a device like this, before learning as much as one could about it, would be lunatic foolhardiness. It looked like too good a bet that the next serious mistake made by anybody would finish them all—

Perhaps it was only because Gefty's nerves were on edge that he grew aware at that point in his reflections of two minor signals from his senses. One was that the smell of ammonia, which he had almost stopped noticing, was becoming appreciably stronger. The other was the faintest of sounds—a whispering suggestion of motion somewhere behind him. But here in the storage vault nothing should have moved, and Gefty's muscles were tensing as his head came around. Almost in the same instant, he flung himself wildly to one side, stumbling and regaining his balance as something big and dark slapped heavily down on the floor at the point where he had stood. Then he was darting up through the entrance passage, turning, and knocking down the lock switches on the outside door panel.

It came flowing around the corner of the passage behind him as the vault doors began to slide together. He was aware mainly of swift, smooth, oiling motion like that of a big snake; then, for a fraction of a second, a strip of brighter light from the outside passage showed a long, heavy wedge of a head, a green metal-glint of staring eyes.

The doors closed silently into their frames and locked. The thing was inside. But it was almost a minute then

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before Gefty could control his shaking legs enough to start moving back towards the main deck. In the half-dark of the vault, it had looked like a big coiled cable lying next to the packing cases. Like Maulbow, it might have been battered around and knocked out during the recent disturbance; and when it recovered, it had found Gefty in the vault with it. But it might also have been awake all the while, waiting cunningly until Gefty's attention seemed fixed elsewhere before launching its attack. It was big enough to have flattened him and smashed every bone in his body if the stroke had landed.

Some kind of guard animal—a snakelike watchdog? What other connection could it have with the mystery machine? Perhaps Maulbow had intended to leave it confined in one of the cases, and it had broken loose—

Too many questions by now, Gefty thought. But Maulbow had the answers.

He was hurrying up the main deck's central passage when Maulbow's voice addressed him sharply from a door he'd just passed.

"Stop right there, Rammer! Don't dare to move! I—"

The voice ended on a note of surprise. Gefty's reaction had not been too rational, but it was prompt. Maulbow's tone and phrasing implied he was armed. Gefty wasn't, but he kept a gun in the instrument room for emergencies. He'd been through a whole series of unnerving experiences, winding up with being shagged out of his storage vault by something that stank of ammonia and looked like a giant snake. To have one of the *Queen's* passengers order him to stand where he was topped it off. Every other consideration was swept aside by a great urge to get his hands on his gun.

He glanced back, saw Maulbow coming out of the half-opened door, something like a twenty-inch, thin, white rod in one hand. Then Gefty went bounding on along the passage, hunched forward and zigzagging from wall to wall to give Maulbow—if the thing he held was a weapon and he actually intended to use it—as small and erratic a target as possible. Maulbow shouted angrily behind him. Then, as Gefty came up to the next cross-passage, a line of white fire seared through the air across his shoulders and smashed off the passage wall.

With that, he was around the corner, and boiling mad. He had no great liking for gunfire, but it didn't shake him like the silently attacking beast in the dark storage had done. He reached the deserted instrument room not many seconds later, had his gun out and cocked, and was faced back towards the passage by which he had entered. Maulbow, if he had pursued without hesitation, should be arriving by now. But the passage stayed quiet. Gefty couldn't see into it from where he stood. He waited, trying to steady his breathing, wondering where Kerim Ruse was and what had got into Maulbow. After a moment,

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without taking his eyes from the passage entrance, he reached into the wall closet from which he had taken the gun and fished out another souvenir of his active service days, a thin-bladed knife in a slip-sheath. Gefty worked the fastenings of the sheath over his left wrist and up his forearm under his coat, tested the release to make sure it was functioning, and shook his coat sleeve back into place.

The passage was still quiet. Gefty moved softly over to one of the chairs, took a small cushion from it and pitched it out in front of the entrance.

There was a hiss. The cushion turned in midair into a puff of bright white fire. Gefty aimed his gun high at the far passage wall just beyond the entrance and pulled the trigger. It was a projectile gun. He heard the slug screech off the slick plastic bulkhead and go slamming down the passage. Somebody out there made a startled, incoherent noise. But not the kind of a noise a man makes when he's just been hit.

"If you come in here armed," Gefty called, "I'll blow your head off. Want to stop this nonsense now?"

There was a moment's silence. Then Maulbow's voice replied shakily from the passage. He seemed to be standing about twenty feet back from the room.

"If you'll end your thoughtless attempts at interference, Rammer," he said, "there will be no trouble." He was speaking with the restraint of a man who is in a state of cold fury. "You're endangering us all. You must realize that you have no understanding of what you are doing."

Well, the last could be true enough. "We'll talk about it," Gefty said without friendliness. "I haven't done anything yet, but I'm not just handing the ship over to you. And what have you done with Miss Ruse?"

Maulbow hesitated again. "She's in the map room," he said then. "I . . . it was necessary to restrict her movements for a while. But you might as well let her out now. We must reach an agreement without loss of time."

Gefty glanced over his shoulder at the small closed door of the map room. There was no lock on the door, and he had heard no sound from inside; this might be some trick. But it wouldn't take long to find out. He backed up to the wall, pushed the door open and looked inside.

Kerim was there, sitting on a chair in one corner of the tiny room. The reason she hadn't made any noise became clear. She and the chair were covered by a rather closely fitting sack of transparent, glistening fabric. She stared out through it despairingly at Gefty, her lips moving urgently. But no sound came from the sack.

Gefty called angrily, "Maulbow—"

"Don't excite yourself, Rammer." There was a suggestion of what might be contempt in Maulbow's tone now. "The girl hasn't been harmed. She can breathe easily through the restrainer. And you can remove it by pulling at the material from outside."

Gefty's mouth tightened. "I'll keep my gun on the passage while I do it—"

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Maulbow didn't answer. Gefty edged back into the map room, tentatively grasped the transparent stuff above Kerim's shoulder. To his surprise, it parted like wet tissue. He pulled sharply, and in a moment Kerim came peeling herself out of it, her face tear-stained, working desperately with hands, elbows and shoulders.

"Gefty," she gasped, "he . . . Mr. Maulbow—"

"He's out in the passage there," Gefty said. "He can hear you." His glance shifted for an instant to the wall where a second of the shroudlike transparencies was hanging. And who could that have been intended for, he thought, but Gefty Rammer? He added, "We've had a little trouble."

"Oh!" She looked out of the room towards the passage, then at the gun in Gefty's hand, then up at his face.

"Maulbow," Gefty went on, speaking distinctly enough to make sure Maulbow heard, "has a gun, too. He'll stay there in the passage and we'll stay in the instrument room until we agree on what should be done. He's responsible for what's happened and seems to know where we are."

He looked at Kerim's frightened eyes, dropped his voice to a whisper. "Don't let this worry you too much. I haven't found out just what he's up to, but so far his tricks have pretty much backfired. He was counting on taking us both by surprise, for one thing. That didn't work, so now he'd like us to co-operate."

"Are you going to?"

Gefty shrugged. "Depends on what he has in mind. I'm just interested in getting us out of this alive. Let's hear what Maulbow has to say—"

Some minutes later Gefty was trying to decide whether it was taking a worse risk to believe what Maulbow said than to keep things stalled on the chance that he was lying.

Kerim Ruse, perched stiffly erect on the edge of a chair, eyes big and round, face almost colorless, apparently believed Maulbow and was wishing she didn't. There was, of course, some supporting evidence . . . primarily the improbable appearance of their surroundings. The pencil-thin fire-spouter and the sleazy-looking "restrainer" had a sufficiently unfamiliar air to go with Maulbow's story; but as far as Gefty knew, either of them could have been manufactured in the Hub.

Then there was the janandra—the big, snakish thing in the storage which Maulbow had brought back up from the moon along with the battered machine. It had been, he said, his shipboard companion on another voyage. It wasn't ordinarily aggressive—Gefty's sudden appearance in the vault must have startled it into making an attack. It was not exactly a pet. There was a psychological relationship between it and Maulbow which Maulbow would not attempt to explain because Gefty and Kerim would be unable to grasp its significance. The janandra was essential, in this unexplained manner, to his well-being.

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That item was almost curious enough to seem to substantiate his other statements; but it didn't really prove anything. The only point Gefty didn't question in the least was that they were in a bad spot which might be getting worse rapidly. His gaze shifted back to the screens. What he saw out there, surrounding the ship, was, according to Maulbow, an illusion of space created by the time flow in which they were moving.

Also according to Maulbow, there was a race of the future, human in appearance, with machines to sail the current of time through the universe—to run and tack with the winds of time, dipping in and out of the normspace of distant periods and galaxies as they chose. Maulbow, one of the explorers, had met disaster a million light-years from the home of his kind, centuries behind them, his vehicle wrecked on an airless moon with damaged control unit and shattered instruments. He had made his way to a human civilization to obtain the equipment he needed, and returned at last with the *Silver Queen* to where the time-sailer lay buried.

Gefty's lip curled. No, he wasn't buying all that just yet—but if Maulbow was *not* lying, then the unseen stars were racing past, the mass of the galaxy beginning to slide by, eventually to be lost forever beyond a black distance no space drive could span. The matter simply had to be settled quickly. But Maulbow was also strained and impatient, and if his impatience could be increased a little more, he might start telling the things that really mattered, the things Gefty had to know. Gefty asked slowly, as if hesitant to commit himself, "Why did you bring us along?"

The voice from the passage snapped, "Because my resources were nearly exhausted, Rammer! I couldn't obtain a new ship. Therefore I chartered yours; and you came with it. As for Miss Ruse—in spite of every precaution, my activities may have aroused suspicion and curiosity among your people. When I disappeared, Miss Ruse might have been questioned. I couldn't risk being followed to the wreck of the sailer, so I took her with me. And what does that mean against what I have offered you? The greatest adventure—followed, I give you my solemn word, by a safe return to your own place and time, and the most generous compensations for any inconvenience you may have suffered!"

Kerim, looking up at Gefty, shook her head violently. Gefty said, "We find it difficult to take you on trust now, Maulbow. Why do you want to get into the instrument room?"

Maulbow was silent for some seconds. Then he said, "As I told you, this ship would not have been buffeted about during the moments of transfer if the control unit were operating with complete efficiency. Certain adjustments will have to be made in the unit, and this should be done promptly."

"Where do the ship instruments come in?" Gefty asked.

"I can determine the nature of the

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problem from them. When I was . . . stranded . . . the unit was seriously damaged. My recent repairs were necessarily hasty. I—"

"What caused the crack-up?"

Maulbow said, tone taut with impatience, "Certain sections of the Great Current are infested with dangerous forces. I shall not attempt to describe them . . ."

"I wouldn't get it?"

"I don't pretend to understand them very well myself, Rammer. They are not life but show characteristics of life—even of intelligent life. If you can imagine radiant energy being capable of conscious hostility . . ."

There was a chill at the back of Gefty's neck. "A big, fast-moving light?"

"Yes!" Sharp concern showed suddenly in the voice from the passage. "You . . . when did you see that?"

Gefty glanced at the screens.

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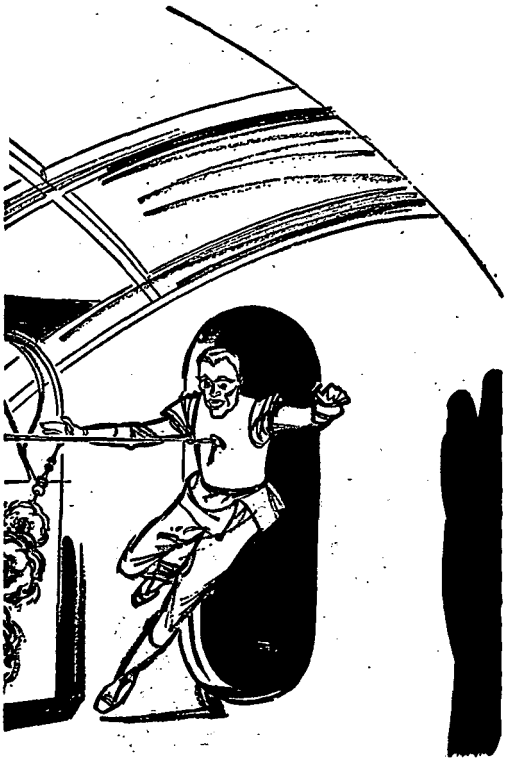

"Twice since you've been talking. And once before—immediately after we got tumbled around."

"Then we can waste no more time, Rammer. Those forces are sensitive to the fluctuations of the control unit. If they were close enough to be seen, they're aware the ship is here. They were attempting to locate it."

"What could they do?"

Maulbow said, "A single attack was enough to put the control unit out of operation in my sailer. The Great Current then rejected us instantly. A ship of this size might afford more protection, which is the reason I chose it. But if the control unit is not adjusted immediately to enable it to take us out of this section, the attacks will continue until the ship—and we—have been destroyed."

Gefty drew a deep breath. "There's another solution to that problem, Maulbow. Miss Ruse and I prefer it. And if you meant what you said—that you'd see to it we got back eventually—you shouldn't object either."

The voice asked sharply, "What do you mean?"

Gefty said, "Shut the control unit off. From what you were saying, that throws us automatically back into normspace, while we're still close enough to the Hub. You'll find plenty of people there who'll stake you to a trip to the future if they can go along and are convinced they'll return. Miss Ruse and I don't happen to be that adventurous."

There was silence from the passage. Gefty added, "Take your time to make up your mind about it, if you want to. I don't like the idea of those lights hitting us, but neither do you. And I think I can wait this out as well as you can . . ."

The silence stretched out. Presently Gefty said, "If you do accept, slide that fire-shooting device of yours into the room before you show up. We don't want accidents."

He paused again. Kerim was chewing her lips, hands clenched into small fists in her lap. Then Maulbow

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answered, voice flat and expressionless now.

"The worst thing we can do at present," he said, "is to prolong a dispute about possible courses of action. If I disarm, will you lay aside your gun?"

"Yes."

"Then I accept your conditions, disappointing as they are."

He was silent. After a moment, Gefty heard the white rod clatter lightly along the floor of the passage. It struck the passage wall, spun off it, and rolled into the instrument room, coming to rest a few feet away from him. Gefty hesitated, picked it up and laid it on the wall table. He placed his own gun beside it, moved a dozen steps away. Kerim's eyes followed him anxiously.

"Gefty," she whispered, "he might . . ."

Gefty looked at her, formed the words "It's all right" with his mouth and called, "Guns have been put aside, Maulbow. Come on in, and let's keep it peaceable."

He waited, arms hanging loosely at his side, heart beating heavily, as quick footsteps came up the passage. Maulbow appeared in the entrance, glanced at Gefty and Kerim, then about the room. His gaze rested for a moment on the wall table, shifted back to Gefty. Maulbow came on into the room, turning towards Gefty, mouth twisting.

He said softly, "It is not our practice, Rammer, to share the secrets of the Great Current with other races. I hadn't foreseen that you might become a dangerous nuisance. But now —"

His right hand began to lift, half closed about some small golden instrument. Gefty's left arm moved back and quickly forwards.

The service knife slid out of its sheath and up from his palm as an arrow of smoky blackness burst from the thing in Maulbow's hand. The blackness came racing with a thin, snarling noise across the floor towards Gefty's feet. The knife flashed above it, turning, and stood hilt-deep in Maulbow's chest.

Gefty returned a few minutes later from the forward cabin which served as the *Queen's* sick bay, and said to Kerim, "He's still alive, though I don't know why. He may even recover. He's full of anesthetic, and that should keep him quiet till we're back in normspace. Then I'll see what we can do for him."

Kerim had lost some of her white, shocked look while he was gone. "You knew he would try to kill you?" she asked shakily.

"Suspected he had it in mind—he gave in too quick. But I thought I'd have a chance to take any gadget he was hiding away from him first. I was wrong about that. Now we'd better move fast . . ."

He switched the emergency check panel back on, glanced over the familiar patterns of lights and numbers. A few minor damage spots were indicated, but the ship was still fully operational. One minor damage spot

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which did not appear on the panel was now to be found in the instrument room itself, in the corner on which the door of the map room opened. The door, the adjoining bulkheads and section of flooring were scarred, blackened, and as assortedly malodorous as burned things tend to become. That was where Gefty had stood when Maulbow entered the room, and if he had remained there an instant after letting go of the knife, he would have been in very much worse condition than the essentially fireproof furnishings.

Both Maulbow's weapons—the white rod lying innocently on the wall table and the round, golden device which had dropped from his hand spitting darts of smoking blackness—had blasted unnervingly away into that area for almost thirty seconds after Maulbow was down and twisting about on the floor. Then he went limp and the firing instantly stopped. Apparently, Maulbow's control of them had ended as he lost consciousness.

It seemed fortunate that the sick bay cabin's emergency treatment accessories, gentle as their action was, might have been designed for the specific purpose of keeping the most violent of prisoners immobilized—let alone one with a terrible knife wound in him. At the angle along which the knife had driven in and up below the ribs, an ordinary man would have been dead in seconds. But it was very evident now that Maulbow was no ordinary man, and even after the eerie weapons had been pitched out of the ship through the instrument room's disposal tube, Gefty couldn't rid himself of an uncomfortable suspicion that he wasn't done with Maulbow yet—wouldn't be done with him, in fact, until one or the other of them was dead.

He said to Kerim, "I thought the machine Maulbow set up in the storage vault would turn out to be some drive engine, but apparently it has an entirely different function. He connected it with the instruments he had made in the Hub, and together they form what he calls a control unit. The emergency panel would show if the unit were drawing juice from the ship. It isn't, and I don't know what powers it. But we do know now that the control unit is holding us in the time current, and it will go on holding us there as long as it's in operation.

"If we could shut it off, the *Queen* would be 'rejected' by the current, like Maulbow's sailer was. In other words, we'd get knocked back into normspace—which is what we want. And we want it to happen as soon as possible because, if Maulbow was telling the truth on that point, every minute that passes here is taking us farther away from the Hub, and farther from our own time towards his."

Kerim nodded, eyes intent on his face.

"Now I can't just go down there and start slapping switches around on the thing," Gefty went on. "He said it wasn't working right, and even if it were, I couldn't tell what would happen. But it doesn't seem to connect

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up with any ship systems—it just seems to be holding us in a field of its own. So I should be able to move the whole unit into the cargo lock and eject it from there. If we shift the *Queen* outside its field, that should have the same effect as shutting the control unit off. It should throw us back into normspace."

Kerim nodded again. "What about Mr. Maulbow's janandra animal?"

Gefty shrugged. "Depends on the mood I find it in. He said it wasn't usually aggressive. Maybe it isn't. I'll get into a spacesuit for protection and break out some of the mining equipment to move it along with. If I can maneuver it into an empty compartment where it will be out of the . . ."

He broke off, expression changing, eyes fastened on the emergency panel. Then he turned hurriedly, reached across the side of the console for the intership airseal controls. Kerim asked apprehensively, "What's the matter, Gefty?"

"Wish I knew . . . exactly." Gefty indicated the emergency panel. "Little red light there, on the storage deck section—it wasn't showing a minute ago. It means that the vault doors have been opened since then."

He saw the same half-superstitious fear appear in her face that had touched him. "You think *he* did it?"

"I don't know." Maulbow's control of the guns had seemed uncanny enough. But that was a different matter. The guns were a product of his own time and science. But the vault door mechanisms? There might have been sufficient opportunity for Maulbow to study them and alter them, for some purpose of his own, since he'd come aboard . . .

"I've got the ship compartments and decks sealed off from each other now," Gefty said slowly. "The only connecting points from one to the other are personnel hatches—they're small air locks. So the janandra's confined to the storage deck. If it's come out of the vault, it might be a nuisance until I can get equipment to handle it. But that isn't too serious. The spacesuits are on the second deck, and I'll get into one before I go on to the storage. You wait here a moment, I'll look in on Maulbow again before I start."

If Maulbow wasn't still unconscious, he was doing a good job of feigning it. Gefty looked at the pale, lax face, the half-shut eyes, shook his head and left the cabin, locking it behind him. It mightn't be Maulbow's doing, but having the big snake loose in the storage could, in fact, make things extremely awkward now. He didn't think his gun would make much impression on anything of that size, and while several of the ship's mining tools could be employed as very effective close-range weapons, they happened, unfortunately, to be stored away on the same deck.

He found Kerim standing in the center of the instrument room, waiting for him.

"Gefty," she said, "do you notice anything? An odd sort of smell . . ."

Then the odor was in Gefty's nos-

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trils, too, and the back of his neck turned to ice as he recognized it. He glanced up at the ventilation outlet, looked back at Kerim.

He took her arm, said softly, "Come this way. Keep very quiet! I don't know how it happened, but the janandra's on the main deck now. That's what it smells like. The smell's coming through the ventilation system, so the thing's moving around in the port section. We'll go the other way."

Kerim whispered, "What will we do?"

"Get ourselves into spacesuits first, and then get Maulbow's control unit out of the ship. The janandra may be looking around for him. If it is, it won't bother us."

He hadn't wanted to remind Kerim that, from what Maulbow said, there might be more than one reason for getting rid of the control unit as quickly as possible. But it had been constantly in the back of his mind; and twice, in the few minutes that passed after Maulbow's strange weapons were silenced; he had seen a momentary pale glare appear in the unquiet flow of darkness reflecting in the viewscreens. Gefty had said nothing, because if it was true that hostile forces were alert and searching for them here, it added to their immediate danger but not at all to the absolute need to free themselves from the inexorable rush of the Great Current before they were carried beyond hope of return to their civilization.

But those brief glimpses did add to the sense of urgency throbbing in Gefty's nerves, while events, and the equally hard necessity to avoid a fatally mistaken move in this welter of unknown factors, kept blocking him. Now the mysterious manner in which Maulbow's unpleasant traveling companion had appeared on the main deck made it impossible to do anything but keep Kerim at his side. If Maulbow was still capable of taking a hand in matters, there was no reasonably safe place to leave her aboard the *Queen*.

And Maulbow might be capable of it. Twice as they hurried up the narrow, angled passages along the *Queen's* curving hull towards an airseal leading to the next compartment, Gefty caught a trace of the ammonia-like animal odor coming over the ventilating system. They reached the lock without incident; but then, as they came along the second deck hall to the ship's magazine, there was a sharp click in the stillness behind them. Its meaning was disconcertingly apparent. Gefty hesitated, turned Kerim into a side passage, guided her along it.

She looked up at his face. "It's following us?"

"Seems to be." No time for the spacesuits in the magazine now—something had just emerged from the air lock through which they had entered the second deck not many moments before. He helped the girl quickly down a section of ladderlike stairs to the airseal connecting the second deck with the storage, punched a wall button there. As the lock door

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opened, there was another noise from the passage they had just left, as if something had thudded briefly and heavily against one of the bulkheads. Kerim uttered a little gasp. Then they were in the lock, and Gefty slapped down two other buttons, stood watching the door behind them snap shut and, a few seconds later, the one on the far side open on the dark storage deck.

They scrambled down another twelve feet of ladder to the floor of a side passage, hearing the lock snap shut behind them. As it closed, they were in complete darkness. Gefty seized Kerim's arm, ran with her up the passage to the left, guiding himself with his fingertips on the left bulkhead. When they came to a corner, he turned her to the left again. A few seconds later, he pulled open a small door, bundled the girl through, came in himself, and shut the door to a narrow slit behind them.

Kerim whispered shakily, "What will we do now, Gefty?"

"Stay here for the moment. It'll look for us in the vault first."

And it should go to the storage vault first where it had been guarding Maulbow's machine, to hunt for them there. But it might not. Gefty eased the gun from his pocket on the far side of Kerim. Across the dark compartment was another door. They could retreat a little farther here if it became necessary—but not very much farther.

They waited in a silence that was complete except for their unsteady breathing and the distant, deep pulse of the *Queen's* throttled-down drives. He felt Kerim trembling against him. How did Maulbow's creature move through the airseal locks? The operating mechanisms were simple—a dog might have been taught to use them. But a dog had paws . . .

There came the soft hiss of the opening lock, the faintest shimmer of light to the right of the passage mouth he was watching through the door. A heavy thump on the floor below the locks followed, then a hard click as the lock closed and complete darkness returned.

The silence resumed. Seconds dragged on. Gefty's imagination pictured the thing waiting, its great, wedge-shaped head raised as its senses probed the dark about it for a sign of the two human beings. Then a vague rushing noise began, growing louder as it approached the passage mouth, crossing it, receding rapidly again to the left.

Gefty let his breath out slowly, eased the door open and stood listening again. Abruptly, there was reflected light in the lock passage, coming now from the left. He said in a whisper, "It's moving around in the main hall, Kerim. We can go on the other way now, but we'll have to be fast and keep quiet. I've thought of how we can get rid of that thing."

The cargo lock on the storage deck had two inner doors. The one which opened into the side of the vault hall was built to allow passage of the largest chunks of freight the *Queen* was likely to be burdened with; it was

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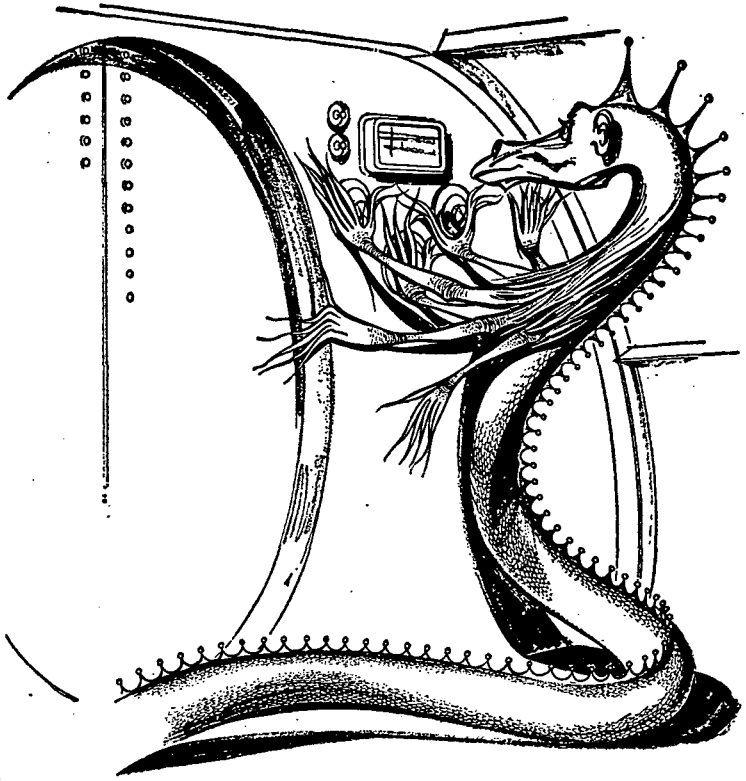

almost thirty feet wide and twenty high. The second door was just large enough to let a man in a spacesuit climb in and out of the side of the lock without using the freight door. It opened on a tiny control cubicle from which the lock's mechanisms were operated during loading processes.

Gefty let Kerim and himself into the cubicle from one of the passages, steered the girl through the pitch blackness of the little room to the chair before the control panel and told her to sit down. He groped for a moment at the side of the panel, found a knob and twisted it. There was a faint click. A scattering of pale lights appeared suddenly on the panel, a dark viewscreen, set at a tilt above them, reflecting their gleam.

Gefty explained in a low voice, "Left side of that screen covers the lock. Right one covers the big hall outside. No lights in either at the moment, so you don't see anything. Only way the cargo door to the hall can be opened or closed is with these switches right here. What I want to do is get the janandra into the lock,

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slam the door on it and lock down the control switches. Then we've got it trapped."

"But how are you going to get it to go in there?"

"No real problem—I'll be three jumps ahead of it. Then I duck back up into this cubicle, and lock both doors. And it'll be inside the lock. You have the picture now?"

Kerim said unsteadily, "I do. But it sounds awfully risky, Gefty."

"Well, I don't like it either," Gefty admitted: "So I'll start right now before I lose my nerve. As soon as I move out into the vault hall, the lighting will go on. That's automatic. You watch the right side of the screen. If you see the janandra coming before I do, yell as loud as you can."

He shifted the two inner door switches to the right. A red spark appeared in the dark viewscreen, high up near the center. A second red light showed on the cubicle bulkhead beside Gefty. Beneath it an oblong section of the bulkhead turned silently away on heavy hinges, became a door two feet in thickness, which stood jutting out at a right angle into the darkness of the cargo lock. A wave of cold air moved through it into the control cubicle.

On the screen, another red spark appeared beside the first one.

"Both doors are open now," Gefty murmured to the girl. "The janandra isn't in the vault hall or the lighting would have turned on, but it may have heard the door open and be on its way. So keep watching the screen."

"I certainly will!" she whispered shakily.

Gefty took an oversized wrench from the wall, climbed quickly and quietly down the three ladder steps to the floor of the lock, and walked across it to the sill of the giant freight door, which now had swung out and down into the vault hall, fitting itself into a depression of the flooring. He hesitated an instant on the sill, then stepped out into the big dark hall. Light filled it immediately in both directions.

He stood quiet, intent on the storage vault entrance far up the hall to his left. He could see the vault was open. The janandra might still be inside it. But the seconds passed, and the dark entrance remained silent and there was no suggestion of motion beyond it. Gefty glanced to the right, moved a dozen steps farther out into the hall, hefted the wrench and spun it through the air towards the ventilator frame on the opposite bulkhead.

The heavy tool clanged loudly against the frame, bounced off and thudded to the floor. Gefty started slowly over to it, heart pounding, with the vault entrance still at the edge of his vision.

Kerim's voice screamed, *"Gefty, it's —"*

He spun around, sprinted back to the cargo lock. The janandra had come silently out of the nearest side passage behind him, was approaching with the remembered oiling swiftness of motion, its great head lifted a yard from the floor. Gefty plunged through the lock, jumped for the top

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of the cubicle door steps, came stumbling into the cubicle. Kerim was on her feet, staring. He swung the cubicle door switch to the left, slapping it flat to the panel. The door snapped back into the wall behind him with a force that shook the floor.

On the screen, the janandra's thick, dark worm-shape was swinging around in the dim lock to regain the open hall. It had seen the trap. But the freight door switch went flat beside the other, and the freight door rose with massive swiftness. The heavy body smashed against it, went sliding back to the floor as the door slammed shut and the screen section showing the cargo lock turned dark.

"Got it—got it—got it!" Gefty heard himself whispering exultantly. He switched on the lock's interior lights.

Then he swore softly, and, beside him, Kerim sucked in her breath.

The screen showed the janandra in violent but apparently purposeful motion inside the lock . . . and it was also apparent now that it was a more complexly constructed creature than the long worm-body and heavy head had indicated. The skin, to a distance of some eight feet back of the head, had spread out into a wide, flexible frill. From beneath the frill extended half a dozen jointed, bone-white arms, along with waving, ribbonlike appendages less easy to define. The thing was reared half up along the hall door, inspecting its surface with these members; then suddenly it flung itself around and flashed over to the outer lock door. Three arms shot out; wiry fingers caught the three spinlocks simultaneously, began to whirl them.

Gefty said, staring, "Kerim, it's going to . . ."

The janandra didn't. The motion checked suddenly, was reversed. The locks drew tight again. The janandra swung back from the door, lifting half its length upwards, big head weaving about as it inspected the tool racks overhead. An arm reached suddenly, snatched something from one of the racks. Then the thing turned again; and in the next instant its head filled the viewscreen. Kerim made a choked sound of fright, jerking back against Gefty. The bulging, metal-green eyes seemed to stare directly at him. And the screen went black.

Kerim whispered, "Wha . . . what happened, Gefty?"

Gefty swallowed, said, "It smashed the view pickup. Must have guessed we were watching and didn't like it . . ." He added, "I was beginning to think Maulbow must be some kind of superman. But it wasn't any remote-control magic of his that let the janandra out of the vault, and opened the intership locks when it came up to the main deck and followed us down again. It was doing all that for itself. It's Maulbow's partner, not his pet. And it's probably got at least as good a brain as anyone else on board behind that ugly face."

Kerim moistened her lips. "Can it . . . could it get out again?"

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"Into the ship?" Gefty shook his head decidedly. "Uh-uh. It could dump itself out on the other side—and it almost did before it realized where it was and what it was about to do. But the inner lock doors won't open until someone opens them right on this panel. No, the thing's safely trapped. On the other hand . . ."

On the other hand, Gefty realized that he wouldn't now be able to bring himself to eject the janandra out of the cargo lock and into the Great Current. Its intentions obviously hadn't been friendly, but its level of intelligence was as good as his own, and perhaps somewhat better; and at present it was helpless. To dispose of it as he'd had in mind would therefore be the cold-blooded murder of an equal. But so long as that ugly and formidable shipmate of Maulbow's stayed in the cargo lock, the lock couldn't be used to get rid of the control unit in the vault.

A new solution presented itself while Gefty was making a rapid and rather desperate mental review of various heavy-duty tools which might be employed as weapons to force the janandra into submission and haul it off for confinement elsewhere in the ship. Not impossible, but a highly precarious and time-consuming operation at best. Then another thought occurred: the safety vault lay directly against the hull of the *Queen*—

How long to cut through the hull? The ship's mining equipment was on board, and the tools were self-powered. Climb into a spacesuit, empty the air from the entire storage deck, leaving the janandra imprisoned in the cargo lock . . . with Maulbow incapacitated in sick bay, and Kerim back in the control compartment and also in a suit, for additional protection. Then cut ship's power to this deck to avoid complications with the *Queen's* involved circuitry and work under space conditions—half an hour if he hurried.

"Shouldn't take more than another ten minutes," he informed Kerim presently over the suit's intercom.

"I'm very glad to hear it, Gefty." She sounded shaky.

"Anything going on in the screens?" he asked.

She hesitated a little, said, "No. Not at the moment."

Gefty grunted, blinked sweat from his eyes, and took hold of the handgrips of the heavy mining cutter again, turning it nose down towards the vault floor. The guide light found the point he was working on, and the slice beam stabbed out, began nibbling delicately away to extend the curving line it had eaten through the *Queen's* thick skin. He had drawn a twenty-five foot circle around Maulbow's battered control unit and the instruments attached to it, well outside the fragile-looking safety field. The circle was broken at four points where he would plant explosives. The explosives, going off together, should shatter the connecting links with the hull and throw the machine clear. If that didn't release them immediately from its influence, he would see what

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putting the *Queen's* drives into action would do.

"Gefty?" Kerim's voice asked.

"Uh-huh?"

He could hear her swallow over the intercom. "Those lights are back now."

"How many?"

"Two," Kerim said. "I *think* they're only two. They keep crossing back and forth in front of us." She laughed nervously. "It's idiotic, of course, but I do get the feeling they're looking at us."

Gefty said hesitantly, "Everything's set but I need another minute or two to get this last connection whittled down a little more. If I blow the charge too soon, it mightn't take the gadget clean out of the ship."

Kerim said, "I know. I'll just watch . . . they just disappeared again." Her voice changed. "Now there's something else."

"What's that?"

"You know you said to watch the cargo lock lights on the emergency panel."

"Yes."

"The outer lock door has just been opened."

"What!"

"It must have been. The light started blinking red just now as I was looking at it."

Gefty was silent a moment, his mind racing. Why would the janandra open the lock? From what Maulbow had said, it could live for a while without air, but it still could gain nothing but eventual death from leaving the ship—

Unless, Gefty thought, the janandra had become aware in some way that he was about to blow their machine out of the *Queen*. There were grappling lines in the cargo lock, and if four or five of those lines were slapped to the circular section of the hull he'd loosened . . .

"Kerim," he said.

"Yes?"

"I'm going to blow the deal right now. Got your suit snapped to the wall braces like I showed you?"

"Yes, Gefty." Her voice was faint but clear.

He turned the cutter away from the line it had dug, sent it rolling off towards the far wall. He hurried around the circle, checking the four charges, lumbered over to the vault passage, stopped just around the corner. He took the firing box from his suit.

"Ready, Kerim?" He opened the box.

"Ready . . ."

"Here goes!" Gefty reached into the box, twisted the firing handle. Light flared in the vault. The deck shook below him. He came stumbling out from behind the wall.

Maulbow's machine and its stand of instruments had vanished. Where it had stood was a dark circular hole. Nothing else seemed to have happened. Gefty clumped hurriedly over to the mining cutter, swung it around, started more cautiously back towards the hole. He didn't have the faintest idea what would come next, but a definite possibility was that he would see the janandra's dark form flowing up over the rim of the hole. Letting it

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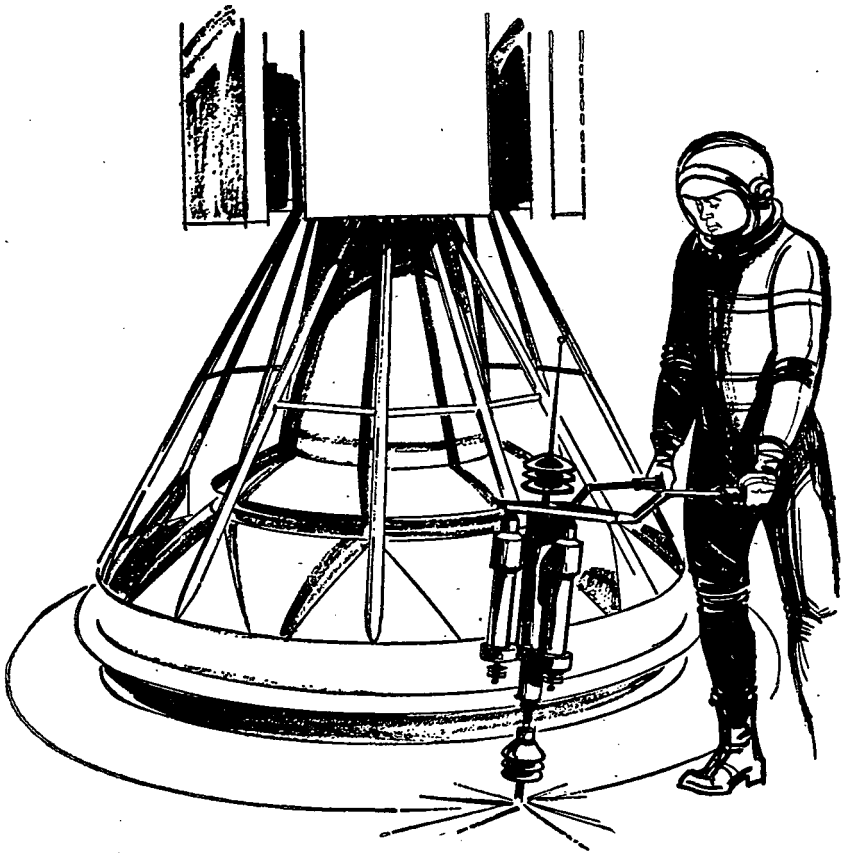

run into the cutter beam might be the best way to discourage it from re-entering the *Queen.*

Instead, a dazzling brilliance suddenly blotted out everything. The cutter was plucked from Gefty's grasp; then he was picked up, suit and all, and slammed up towards the vault ceiling. He had a feeling that inaudible thunders were shaking the ship. He seemed to be rolling over and over along the ceiling. At last, the suit crashed into something which showed a total disinclination to yield, and Gefty blacked out.

The left side of his face felt pushed out of shape; his left eye wasn't functioning too well, and there was a severe pulsing ache throughout the top of his head. But Gefty felt happy.

There were a few qualifying considerations.

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"Of course," he pointed out to Kerim, "all we can really say immediately is that we're back in normspace and somewhere in the galaxy."

She smiled shakily. "Isn't that saying quite a lot, Gefty?"

"It's something." Gefty glanced around the instrument room. He had placed an emergency light on the console, but except for that, the control compartment was in darkness. The renewed battering the *Queen*

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had absorbed had knocked out the power in the forward section. The viewscreens were black, every instrument dead. But he'd seen the stars of normspace through the torn vault floor. It was something . . .

"We might have the light that slugged us to thank for that," he said. "I'm not sure just what did happen there, but it could have been Maulbow's control unit it was attacking rather than the ship. Maulbow said the lights were sensitive to the unit. At any rate, we're here, and we're rid of the gadget—and of the janandra." He hesitated. "I just don't feel you should get your hopes too high. We may find out we're a very long way from the Hub."

Kerim's large eyes showed a degree of confidence which made him almost uncomfortable. "If we are," she said serenely, "you'll get us back somehow."

Gefty cleared his throat. "Well, we'll see. If the power shutoff is something the *Queen's* repair scanners can handle, the instruments will come back on any minute. Give the scanners ten minutes. If they haven't done it by that time, they can't do it and I'll have to play repairman. Then, with the instruments working, we can determine exactly where we are."

Unless, he told himself silently, they'd wound up in a distant cluster never penetrated by the Federation's mapping teams. And there was the other little question of where they now were in time. But Kerim looked rosy with relief, and those details could wait.

He took up another emergency light, switched it on and said, "I'll see how Maulbow is doing while we're waiting for power. If the first aid treatment has pulled him through so far, the autosurgeon probably can fix him up."

Kerim's face suddenly took on a guilty expression. "I forgot all about Mr. Maulbow!" She hesitated. "Should I come along?"

Gefty shook his head. "I won't need help. And if it's a case for the surgeon, you wouldn't like it. Those things work painlessly, but it gets to be a mess for a while."

He shut off the light again when he reached the sick bay which was running on its independent power system. As he opened the cabin door from the dispensary, carrying the autosurgeon, it became evident that Maulbow was still alive but that he might be in delirium. Gefty placed the surgeon on the table, went over to the bed and looked at Maulbow.

To the extent that the emergency treatment instruments' cautious restraints permitted, Maulbow was twisting slowly about on the bed. He was speaking in a low, rapid voice, his face distorted by emotion. The words were not slurred, but they were in a language Gefty didn't know. It seemed clear that Maulbow had reverted mentally to his own time, and for some seconds he remained unaware that Gefty had entered the room. Then, surprisingly, the slitted blue eyes opened wider and focused on Gefty's face. And Maulbow screamed with rage.

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Gefty felt somewhat disconcerted. For the reason alone that he was under anesthetic, Maulbow should not have been conscious. But he was. The words were now ones Gefty could understand, and Maulbow was telling him things which would have been interesting enough under different circumstances. Gefty broke in as soon as he could.

"Look," he said quietly, "I'm trying to help you. I . . ."

Maulbow interrupted him in turn, not at all quietly. Gefty listened a moment longer, then shrugged. So Maulbow didn't like him. He couldn't say honestly that he'd ever liked Maulbow much, and what he was hearing made him like Maulbow considerably less. But he would keep the man from the future alive if he could.

He positioned the autosurgeon behind the head of the bed to allow the device to begin its analysis, stood back at its controls where he could both follow the progress it made and watch Maulbow without exciting him further by remaining within his range of vision. After a moment, the surgeon shut off the first-aid instruments and made unobtrusive use of a heavy tranquilizing drug. Then it waited.

Maulbow should have lapsed into passive somnolence thirty seconds afterwards. But the drug seemed to produce no more effect on him mentally than the preceding anesthetic. He raged and screeched on. Gefty watched him uneasily, knowing now that he was looking at insanity. There was nothing more he could do at the moment—the autosurgeon's decisions were safer than any nonprofessional's guesswork. And the surgeon continued to wait.

Then, abruptly, Maulbow died. The taut body slumped against the bed and the contorted features relaxed. The eyes remained half open; and when Gefty came around to the side of the bed, they still seemed to be looking up at him, but they no longer moved. A thin trickle of blood started from the side of the slack mouth and stopped again.

The control compartment was still darkened and without power when Gefty returned to it. He told Kerim briefly what had happened, added, "I'm not at all sure now he was even human. I'd rather believe he wasn't."

"Why that, Gefty?" She was studying his expression soberly.

Gefty hesitated, said, "I thought at first he was furious because we'd upset his plans. But they weren't his plans . . . they were the janandra's. He wasn't exactly its servant. I suppose you'd have to say he was something like a pet animal."

Kerim said incredulously, "But that isn't possible! Think of how intelligently Mr. Maulbow . . ."

"He was following instructions," Gefty said. "The janandra let him know whatever it wanted done. He was following instructions again when he tried to kill me after I'd got away from the thing in the vault. The real brain around here was the janandra . . . and it was a real

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brain. With a little luck it would have had the ship."

Kerim smiled briefly. "You handled that big brain rather well, I think."

"I was the one who got lucky," Gefty said. "Anyway, where Maulbow came from, it's the janandra's kind that gives the orders. And the thing is, Maulbow liked it that way. He didn't want it to be different. When the light hit us, it killed the janandra on the outside of the ship. Maulbow felt it happen and it cracked him up. He wanted to kill us for it. But since he was helpless, he killed himself. He didn't want to be healed—not by us. At least, that's what it looks like."

He shrugged, checked his watch, climbed out of the chair. "Well," he said, "the ten minutes I gave the *Queen* to turn the power back on are up. Looks like the old girl couldn't do it. So I'll—"

The indirect lighting system in the instrument room went on silently. The emergency light flickered and went out. Gefty's head came around.

Kerim was staring past him at the screens, her face radiant.

"Oh, Gefty!" she cried softly. "Oh, Gefty! Our stars!"

Green dot here is us," Gefty explained, somewhat hoarsely. He cleared his throat, went on, "Our true ship position, that is—" He stopped, realizing he was talking too much, almost babbling, in an attempt to take some of the tension out of the moment. The next few seconds might not tell them where they were, but it would show whether they had been carried beyond the regions of space charted by Federation instruments. Which would mean the difference between having a chance—whether a good chance or a bad one—of getting home eventually, and the alternative of being hopelessly lost.

There had been nothing recognizably familiar about the brilliantly dense star patterns in the viewscreens, but he gave no further thought to that. Unless the ship's exact position was known or one was on an established route, it was a waste of time looking for landmarks in a sizable cluster.

He turned on the basic star chart. Within the locator plate the green pinpoint of light reappeared, red-ringed and suspended now against the three-dimensional immensities of the Milky Way. It stayed still a moment, began a smooth drift towards Galactic East. Gefty let his breath out carefully. He sensed Kerim's eyes on him but kept his gaze fixed on the locator plate.

The green dot slowed, came to a stop. Gefty's finger tapped the same button four times. The big chart flicked out of existence, and in the plate three regional star maps appeared and vanished in quick succession behind it. The fourth map stayed. For a few seconds, the red-circled green spark was not visible here. Then it showed at the eastern margin of the map, came gliding

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forwards and to the left, slowed again and held steady. Now the star map began to glide through the locator plate, carrying the fixed green dot with it. It brought the dot up to dead center point in the locator plate and stopped.

Gefty slumped a little. He rubbed his hands slowly down his face and muttered a few words. Then he shook his head.

"Gefty," Kerim whispered, "what is it? Where are we?"

Gefty looked at her.

"After we got hauled into that time current," he said hoarsely, "I tried to find out which way in space we were headed. The direction indicators over there seemed to show we were trying to go everywhere at once. You remember Maulbow's control unit wasn't working right, needed adjustments. Well, all those little impulses must have pretty well canceled out because we weren't taken really far. In the last hour and a half we've covered roughly the distance the *Queen* could have gone on her own in, say, thirty days."

"Then where . . ."

"Home," Gefty said simply. "It's ridiculous! Other side of the Hub from where we started." He nodded at the plate. "Eastern Hub Quadrant. Section Six Eight. The G2 behind the green dot—that's the Evalee system. We could be putting down at Evalee Interstellar three hours from now if we wanted to."

Kerim was laughing and crying together. "Oh, Gefty! I knew you would . . ."

"A fat lot I had to do with it!" Gefty leaned forward suddenly, switched on the transmitter. "And now let's pick up a live newscast. There's something else I . . ."

His voice trailed off. The transmitter screen lit up with a blurred jumble of print, colors, a muttering of voices, music and noises. Gefty twisted a dial. The screen cleared, showed a newscast headline sheet. Gefty blinked at it, glanced sideways at Kerim, grimaced.

"The something else," he said, his voice a little strained, "was something I was also worried about. Looks like I was more or less right."

"Why, what's wrong?"

"Nothing really bad," Gefty assured her. He added, "I think. But take a look at the Federation dateline."

Kerim peered at the screen, frowned. "But . . ."

"Uh-huh."

"Why, that . . . that's almost . . ."

"That," Gefty said, "or rather *this* is the day after we started out from the Hub, headed roughly Galactic west. Three weeks ago. We'd be just past Miam." He knuckled his chin. "Interesting thought, isn't it?"

Kerim was silent for long seconds. "Then they . . . or we . . ."

"Oh, they're us, all right," Gefty said. "They'd have to be, wouldn't they?"

"I suppose so. It seems a little confusing. But I was thinking. If you send them a transmitter call . . ."

Gefty shook his head. "The *Queen's* transmitter isn't too hot, but

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it might push a call as far as Evalee. Then we could arrange for a Com-Web link-up there, and in another ten minutes or so . . . but I don't think we'd better."

"Why not?" Kerim demanded.

"Because we got through it all safely, so we're going to get through it safely. But if we receive that message now and never go on to Maulbow's moon . . . you see? There's no way of knowing just what would happen."

Kerim looked hesitant, frowned. "I suppose you're right," she agreed reluctantly at last. "So Mr. Maulbow will have to stay dead now. And that janandra." After a moment she added pensively, "Of course, they weren't really very nice—"

Gefty shivered. One of the things he'd learned from Maulbow's ravings was the real reason he and Kerim had been taken along on the trip. He didn't feel like telling Kerim about it just yet, but it had been solely because of Maulbow's concern for his master's creature comforts. The janandra could go for a long time without food, but after fasting for several years on the moon, a couple of snacks on the homeward run would have been highly welcome.

And the janandra was a gourmet. It much preferred, as Maulbow well knew, to have its snacks still wriggling-fresh as it started them down its gullet.

"No," Gefty said, "I couldn't call either of them really nice." ■

IN TIMES TO COME

When Earthmen first go out into the Galaxy—they may discover it's already well organized, well populated, and well-civilized. And that Terrestrial standards of values are distinctly provincial. This has been suggested before, of course.

But what if one Earthman, quite undistinguished at home, suddenly discovers he is enormously valued on the Galactic value scale for a talent he doesn't realize he has, and that Earth has always considered unreal . . .?

How do you fit into a Galactic culture which eagerly accepts you . . . for reasons you can't understand!

Next month, John Phillifent explores that somewhat upsetting complication in "Ethical Quotient." Makes a nice problem for an unimportant Terrestrial scholar who finds several people anxiously awaiting him . . . some with knives, and some with velvet gowns! *The Editor*

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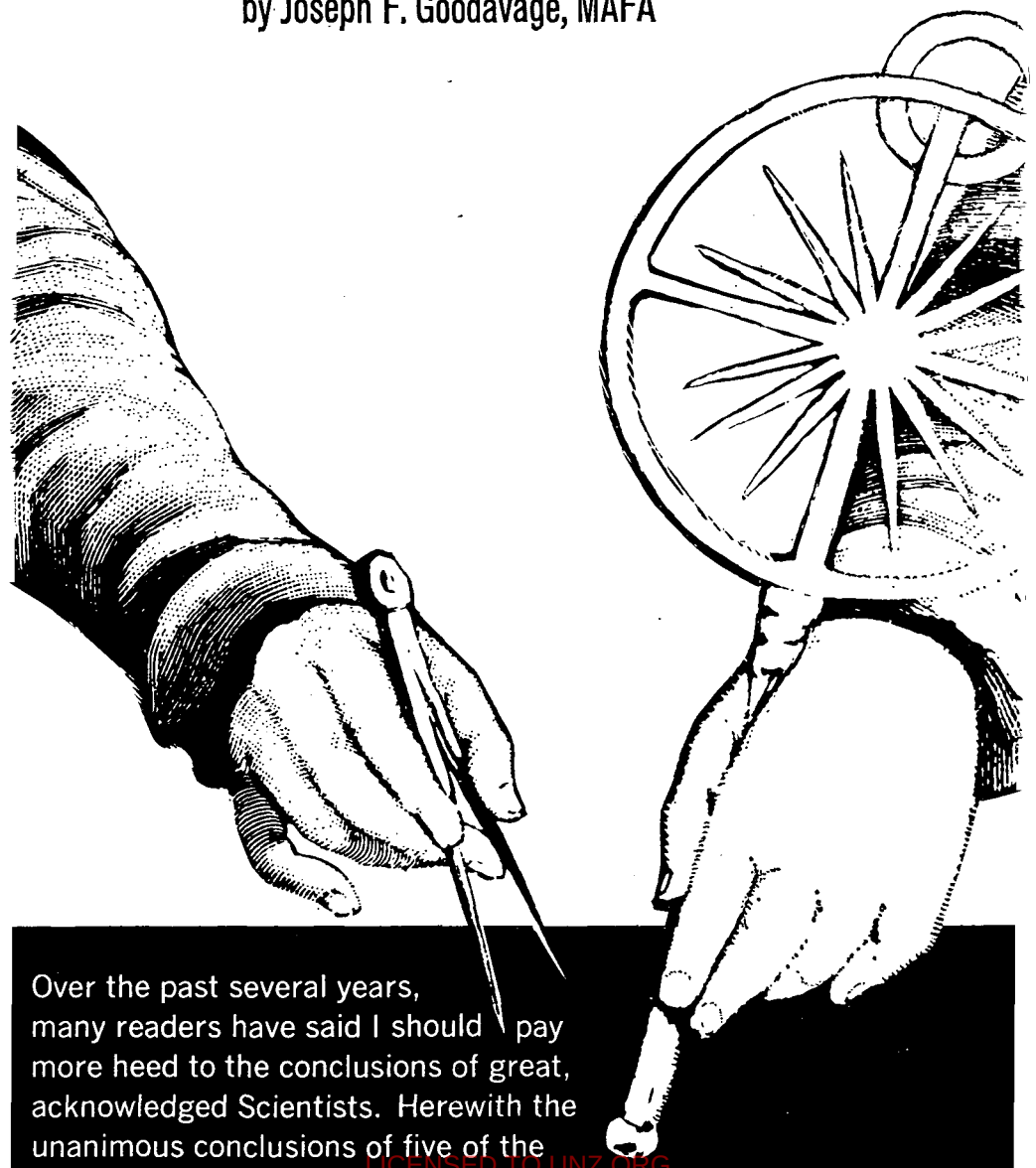
The First Science

by Joseph F. Goodavage, MAFA



Over the past several years, many readers have said I should pay more heed to the conclusions of great, acknowledged Scientists. Herewith the unanimous conclusions of five of the greatest Scientists of all history.

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"*Observation is heaped on observation, tables are compiled, volumes are filled with data, the hours of sunshine are recorded, the fall of rain, the moisture of the air, the kind of clouds, the temperature—millions of facts, but where is the Kepler to study and brood over them; where is the man to spend his life in evolving the beginnings of law and order from the midst of this chaos?*"
—Sir Oliver Lodge, "*Pioneers of Science*"

■ Everyone knows that only charlatans, fools or crackpots believe in astrology.

Yet some of the most prominent and brilliant people in history believed in it—including some of the greatest scientific minds.

Cases in point: Copernicus, Kepler, Galileo, Brahe, and Newton. Not only did each of these titans believe in this superstitious nonsense —*they were primarily astrologers!*

How could they have been so deluded? What could possibly have brought them to accept this ancient belief in omens?

Astrology is the most insidious persuasion in history. Regardless of enlightened scientific condemnation, it has infected the minds of men of all ages. It is a fact of historical record that astrology exists and persists as the most successful intellectual movement of all time. This superstition predates all science, every political system and all religions. It creeps into every intellectual level of every society in every age; it attracts the greatest minds of all cultures—regardless of the prevailing religion or the incumbent political system. It influenced the Arabs, the Greeks, the Hindus, the Romans, the Chinese and the Egyptians as well as the Aztecs or Mayans. It won the believers in Mohammed and the followers of Christ—the believers in the Platonic Eros and in the wisdom of Confucius.

In China astrology affected the minds of the sophisticated mandarin. In Egypt it swayed the superstitious fellahin. It fascinated Stoics in togas and Mystics in robes—the Popes of the Sixteenth Century and the contemplative Buddhists—the seers who wrote the Bible and Hippocrates, the Father of Medicine—Catholic saints and Jewish prophets—the Caesars of the Second Century and the Arabs of the Sixth—the organizers of Rome and the intellectuals of Greece—totalitarian dictators and American presidents —Wall Street brokers and space-age scientists.

But the deeper reasons for the belief in astrology of the founders of the New Cosmology have no relation to those we usually hear:

1. "They didn't *really* believe in astrology. It was only an amusing sideline—a hobby."

Not so. They were neither dabblers nor hobbyists, but dedicated, full-time practitioners of an ancient belief. Astrology was the life work of Kepler; he labored over his laws in order to perfect his astrological predictions. Newton's primary in-

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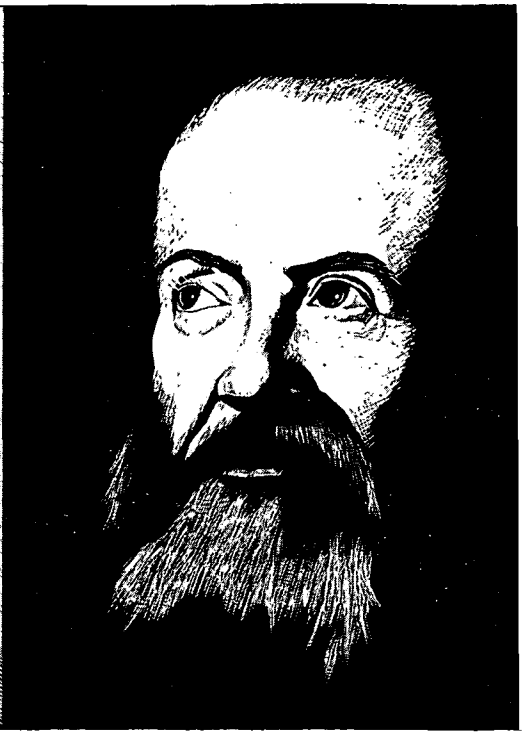
Courtesy: American Museum-Hayden Planetarium

NICOLAUS COPERNICUS
Astrologer



Courtesy: J. Goodavage

GALILEO GALILEI
Astrologer

terest was astrology. It was the problem posed by astrological "influence" which caused him to investigate light and gravity.

2. "They were living in a superstitious age; therefore they were superstitious men."

Wrong. These men broke with all traditional natural philosophy and established their own on the basis of scientific truths they discovered and proved. They were not superstitious in any ordinary sense.

3. "Religion weakened their intellectual discipline."

This doesn't work either. They were devout Christians, but modern astronomy and physics also includes devout Christians who abhor the very mention of astrology.

4. "They were forced by the wealthy and titled to cast horoscopes in order to make a living and continue their astronomical researches."

Wrong again. They were finan-

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cially solvent. The uncle of Copernicus was a sovereign bishop who provided his nephew with a generous lifelong allowance. Kepler was married to a landed and wealthy widow. Galileo was a well-to-do professor of mathematics. Newton lived in a London palace and engaged in philanthropy during most of his astrological researches.

There are no simple answers to the question of why these men fell under the spell of this ancient belief. Most of their astrological writings have yet to be translated from the original Latin. And it wouldn't be completely fair to claim that they "imagined" all the things they came to believe in.

Copernicus is a shining example of how a great mathematical and scientific intellect can be drawn to such beliefs. Here's how it happened:

By the time he was thirty-nine Copernicus was learned in medicine, theology, mathematics, astronomy and Greek. He was personal physician to his uncle, the Bishop-prince of Ermeland diocese. When the bishop died, Copernicus became famous as a soldier and commandant as well as a mathematician. He set up the defense which drove off hordes of Teutonic knights, and later, Polish occupation troops.

When peace returned to the diocese, Copernicus, now a hero, returned to his studies of medicine, astronomy and history. This inevitably led him to the Greeks.

Courtesy: J. Goodavage

TYCHO BRAHE
Astrologer

He was fascinated by their astronomy, but there is no proof that he blindly accepted the theories of Meton, Pythagoras, Aristotle and Ptolemy, all of whom were astrologers—while there is evidence that he questioned them.

Pythagoras, the Greek philosopher-astrologer, born in 572 B.C., predated Meton by more than a century and was generally credited for discovering that the Earth is a sphere. By the time of Aristotle—

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Courtesy: American Museum-Hayden Planetarium

JOHANNE KEPLER
Astrologer

Courtesy: American Museum-Hayden Planetarium

SIR ISAAC NEWTON
Astrologer

384–322 B.C.—this concept was already well established among the scholars of that period.

Copernicus as a doctor himself was stimulated by the ideas of Hippocrates, the Father of Medicine. Hippocrates had constructed a system of medical study which stressed purposeful creation. He was an authority on treatments of disease and diagnoses based on astronomical ideas. He based the famous Hippocratic crises on the hexagon angles of the Moon's monthly motion in the cases of fevers, diseases, minor ailments and even surgical operations.

These periods were timed from the moment a patient took to bed—or when surgery began. The critical periods were 3½, 7, 10½, 14, 17½, 21, 24½ and 28 days. The "triangle" periods of *nine* and *eighteen* days and a minor 4½-day period were those when change and improvement were expected. If an ailment

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continued after 28 days without definite improvement, it entered the chronic category. Chronic disorders, Hippocrates stated, were then related to solar signature and Sun configurations, whence the 45–90 day periods observed for recurring attacks or changes.

Even though there is a remarkably close correlation to soli-lunar cycles here, the fact that these crises are still used by modern medical men does not validate the assumption that they are caused by the Sun and Moon. Copernicus believed it was confirmed not only by his studies, but by his own medical experience. It was only a matter of time then, for the Polish astronomer to accept Hippocrates' strange correlations between celestial motions, medicine and mathematics.

Hippocrates taught that there was an astronomical correspondence for every known rhythm, periodicity or cycle of time, whether applied to the earth or to the life upon it.

Hippocrates notwithstanding, Copernicus discovered that more than eight hundred years before the Greeks, the Egyptians had imagined a connection between the different parts of the body and the "Signs" of the zodiac.

It was then a matter of established record that the Egyptians and Babylonians, the Chaldeans and Sumerians possessed superior skills in the sciences, medicine and philosophy, than the Greeks. The Greeks themselves admitted this by the fact that their most distinguished philosophers traveled to Memphis and Babylon to study geometry, astrology and astronomy. Thus the bits and fragments of science gathered by Thales, Pythagoras and Democrates, which was absorbed by the Greek culture, belonged to a once-mighty system. The truth is that astrology, the pariah of science, was the keystone of this system.

It was no secret that the Chaldeans had a cycle called Saros, which consisted of 3,600 years, the time taken by a "fixed star" to move through a degree of a circle.

When the Alexandrian School of Mathematics and Astronomy was formed, the Greeks quickly surpassed the fame of their predecessors. But there was no reason to believe that the Alexandrian library knew any more than Pythagoras had brought back from Chaldea and Egypt. Democritus, Plato and Eudoxus also gathered nuggets of wisdom from this people of a great past.

The one thing that Copernicus could never bring himself to understand about Greek and Egyptian astrology were the twelve "zones of influence" or "houses." This notion, in one form or another, predated all astronomical and astrological history. It was just there one day, as if in a flash of mystical insight. It had no connection with astronomy nor with any empirical data. It seemed to be a geometrical

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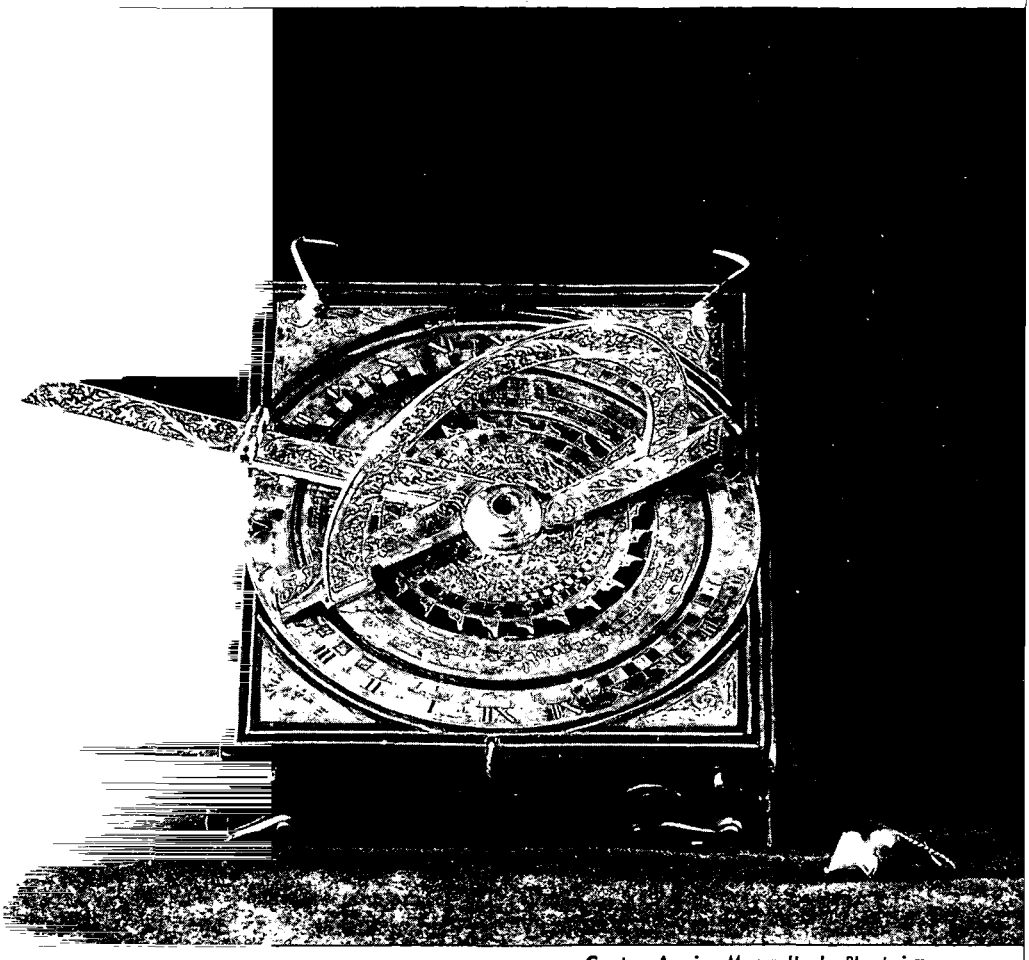

Courtesy: American Museum-Hayden Planetarium

"Astrolabe" Early astrological observational instruments lacked sophistication of theory—but for perfection of workmanship no modern observatory instrument could excel this Renaissance Astrolabe!

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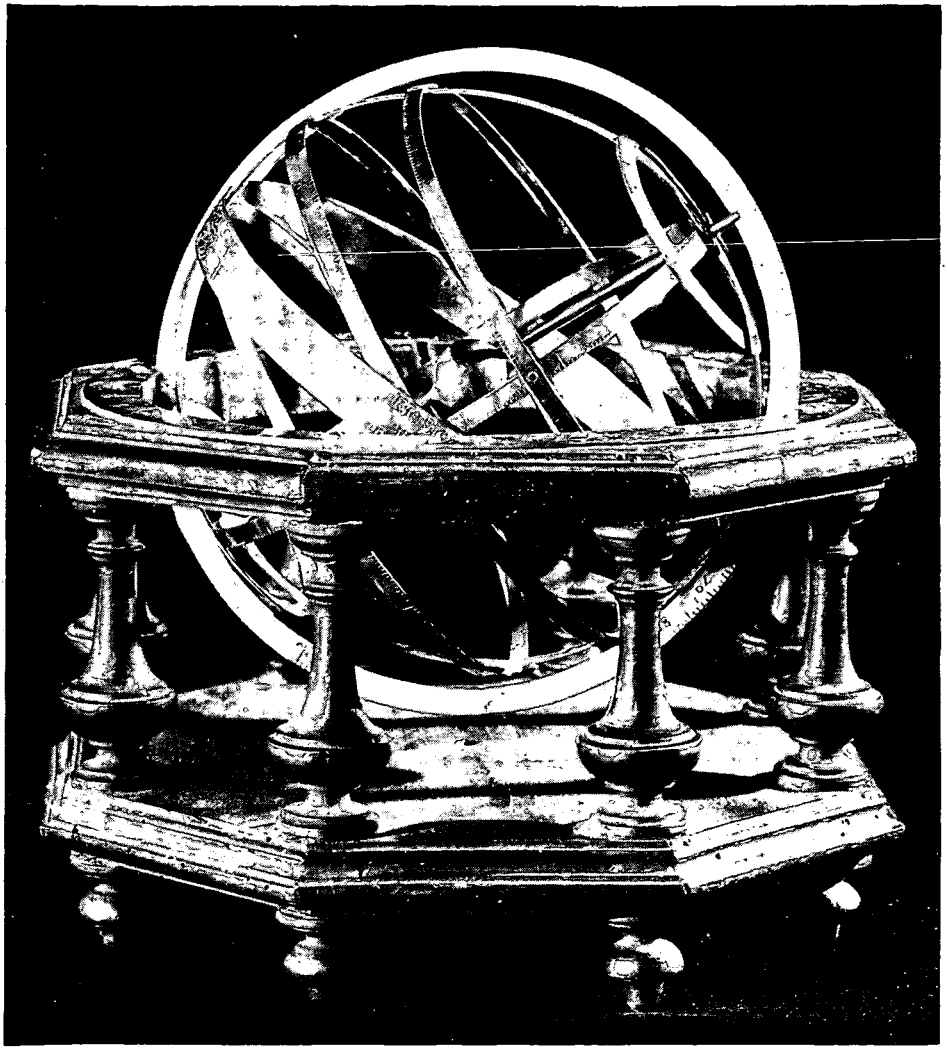
Italian Armillary Sphere
A thoroughly functional Armillary Sphere of the Sixteenth Century—indicating a craftsman doesn't need machine tools to achieve accuracy of figure.

Courtesy: American Museum-Hayden Planetarium



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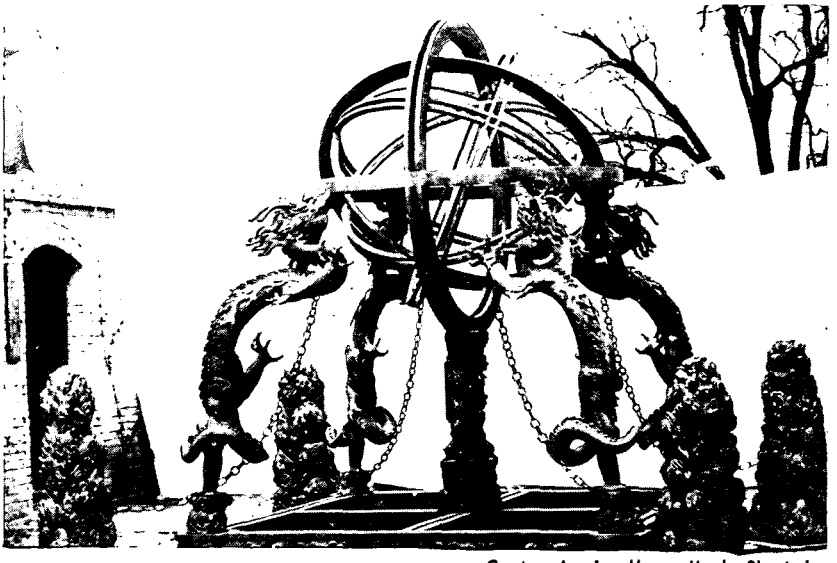

Courtesy: American Museum-Hayden Planetarium

An ancient Armilla in Peking, China. Remember it was the Chinese astrologers who recorded the supernova explosion whose remnant we know as the Crab Nebula, in 1054 A.D. Aesthetics (?!) combined with function.

notion with no relationship to anything he recognized as real. But simply because it was there, he put it into practice and became convinced that it did indeed work.

Adding his voice to the tumult of astrologers in the middle ages, Copernicus cried out for facts and experiments. He contended from his study of eclipses that these phenomena presaged radical change. In the case of total solar eclipses, he found that troops were shifted along lines delineating the path of totality, and that those European rulers who were born during an eclipse while Mars was within five degrees of the midheaven eventually died a violent death.

It happened that on November 2, 878 A.D., a total annular eclipse's path traversed what is now called Old Wapping Road—from Chester to London, England. King Alfred stopped the invading Vikings dead in their tracks along a line defined by the edge of the eclipse path, Vikings on one side and Britons on the other; the country was divided.

(Correspondents in World War II reported that Allied military observers and strategists noticed mass

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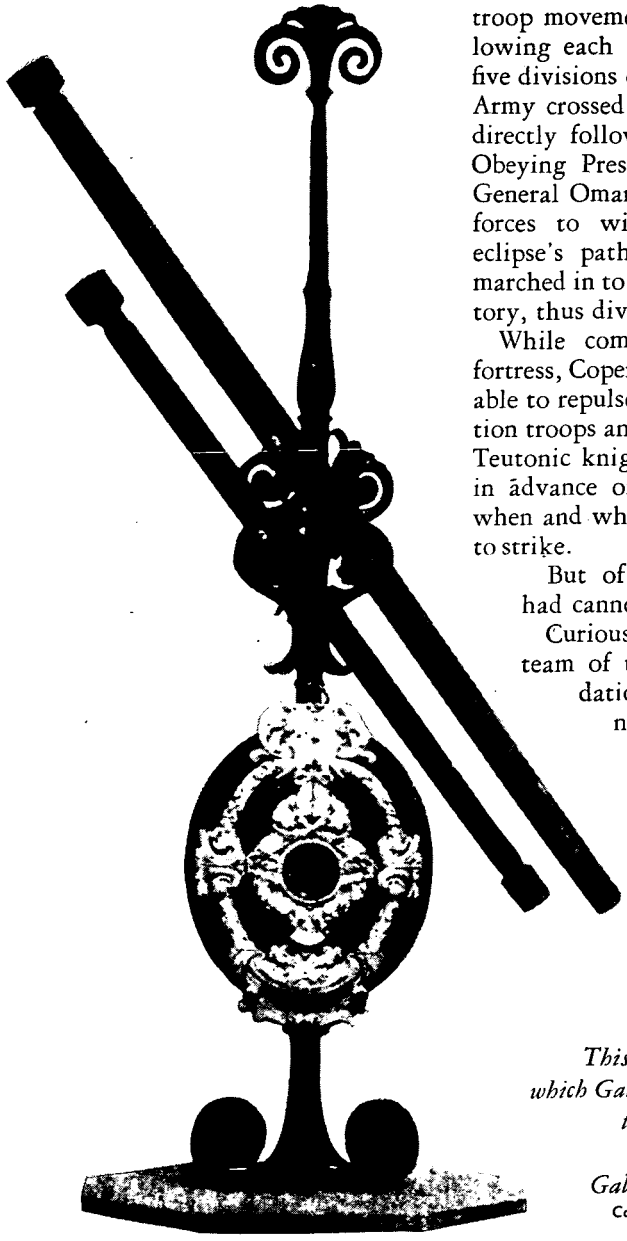

troop movements immediately following each eclipse. Accordingly, five divisions of the American First Army crossed the Rhine in 1945—directly following a solar eclipse. Obeying Presidential instructions, General Omar Bradley ordered his forces to withdraw—behind the eclipse's path—as Russian troops marched in to occupy German territory, thus dividing the country!)

While commanding his lonely fortress, Copernicus claimed he was able to repulse both Polish occupation troops and attacking hordes of Teutonic knights because he knew in advance of the eclipse exactly when and where they would move to strike.

But of course . . . he also had cannon.

Curiously enough, a research team of the Llewellyn Foundation in St. Paul, Minnesota, claims that a statistical analysis of astrology reveals that Mars does tend to be

"Galileo's Telescope"
This is the telescope through which Galileo's opponents refused to look, for fear of seeing the Moons of Jupiter—Galileo's original telescope.
Courtesy: American Museum-Hayden Planetarium

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within 5° of the midheaven at the birth of anyone who subsequently dies a violent death. Even if this could be true, it would not validate Copernicus' exact theory because it shows that eclipses had no correlation with the violent deaths—nor did it deal solely with kings or rulers.

The great Polish astronomer seemed almost destined to formulate a rational scientific concept of the universe, but he spent his intellectual forces in a lifelong struggle to comprehend and systematize the astrology of the Greeks and Egyptians.

Was Copernicus a total fool? Did he, as well as Tycho Brahe and Kepler, imagine there was *something* operating when actually there was nothing? If not, what could they have discovered? Or what do we know that they *didn't* know?

Naturally, they knew nothing about magnetic storms—nor did they know the ionosphere existed. And they couldn't have known about sunspots nor solar flares. Nor could they have known about the Sun's rotational period. They thought the Sun was stationary and spotless.

It hardly seems possible that great intellects like Kepler and Newton were totally devoid of basic scientific know-how or even common sense. But their belief in astrology indicates that they must have been . . . or that we are?

Tycho Brahe belongs in this category. But he is justly credited with providing the exact planetary figures which enabled his most promising pupil, Johannes Kepler, to work out his great laws of motion. Yet Tycho had another side to his brilliant, exacting and persuasive nature. This is evidenced by the fact that he practiced and defended astrology with all of his power.

In one of his student-day duels, the fiery Dane's nose was sliced off. The resourceful Tycho created a copper proboscis, painted it flesh color and attached it each morning. This disfigurement drove him into a common-law marriage with a peasant woman who bore him seven children. No noblewoman would have him.

But due to the efforts of the greatest astronomer of the time, the Landgrave of Kassel, Denmark's king presented Tycho with an island where Brahe built the first astronomical observatory in the western world—solely for the purpose of expanding and perfecting his astrological work.

In order to do this, Tycho worked out a system of figuring the exact timing of the solar system. The planetary tables of King Alfonso then in use were off by days—even weeks. In order to plot the courses and positions of the planets, *minutes* were of prime importance to Tycho Brahe.

Kepler's young mind was totally unacquainted with astrology when he came to work as Tycho's assistant. Apparently he began to scoff

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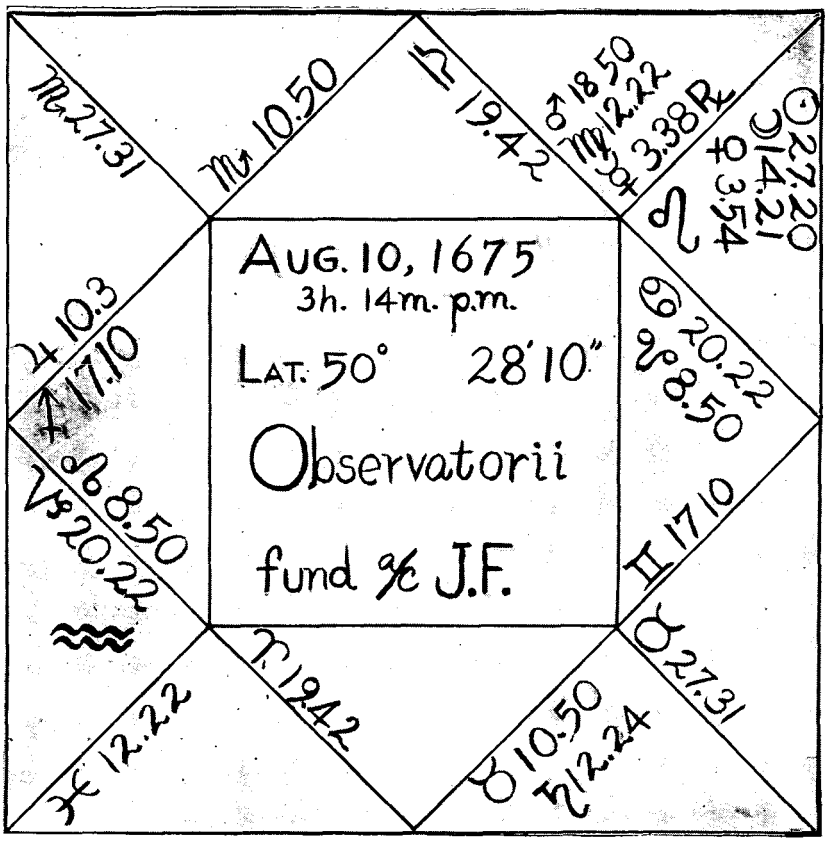

Courtesy: J. Goodavage

The first Astronomer-Royal of England, in 1675 cast this horoscope for the Royal Observatory at Greenwich. Astrologer-Royal would, apparently, be a more accurate title.

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openly at such superstitious nonsense.

"To deny astrology," the noseless Dane thundered, "is to deny the glory of God!"

Kepler demanded to know why, if astrology were so exact, he didn't have the same destiny as his mother, because their horoscopes were identical. The Dane showed him that the planets take millions of years to return to their same positions and relationships to each other, thereby making it impossible for any two living people to have exactly the same planetary natal pattern. He believed that the horoscopes of children and grandchildren were partial recurrences of the planetary patterns of the parents and grandparents. From this, he claimed he could match any horoscope with that of the right parent, provided the timing was correct.*

Brahe was considered an expert on predicting social prominence in any field merely from horoscopic data. He claimed that his study of Jupiter's position on the midheaven —near the upper meridian—indicated success and fame because Jupiter was the "great benefic," the planet of luck, good fortune, expansiveness and prominence.

It happened that Brahe chose Kepler to succeed him because of this placement of Jupiter in young Kepler's horoscope. The Dane predicted that Kepler would carry on his own work and become a world-

*If that could only be established, it should make a fine replacement for the blood tests in paternity suits.

Isaac Newton's second reflecting telescope—with a Seventeenth Century version of an "equatorial mounting."

Courtesy: American Museum-Hayden Planetarium

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famous astrologer. Although Kepler did become an astrologer, and also became famous, it was his three laws of motion which made his name great in the annals of science.

In November, 1572, a brilliant new star appeared in the heavens—a true supernova, the rarest of astronomical events. It was so bright it could be seen in full daylight—and it lasted for eighteen months.

Pressed for an astrological interpretation of this event—actually a supernova in Cassiopeia—the old eccentric published two heavy volumes in which he concluded that a great soldier and humanitarian would arise in Finland and would reign from 1593 and die a violent death in 1632.

Gustavus Adolphus was born in Stockholm in 1594—a year later than predicted—when Finland was a Swedish province, and was killed in battle with Wallenstein's mercenaries in 1632. The fact that Gustavus was a great humanitarian, soldier and patriot convinced every superstitious person of the era that Tycho's prophecy had indeed been fulfilled.

In his earlier travels through Switzerland, Austria and Germany, the Dane showed that the planets influenced the lives of men. He made a study of more than seventy persons born near Basel and Geneva on the same day, in the same year and nearly the same time and place. This group was divided into parcels of two and three each.

Without exception, these small

Courtesy: J. Goodavage

JOHN H. NELSON

Engineer, Propagation Analyst

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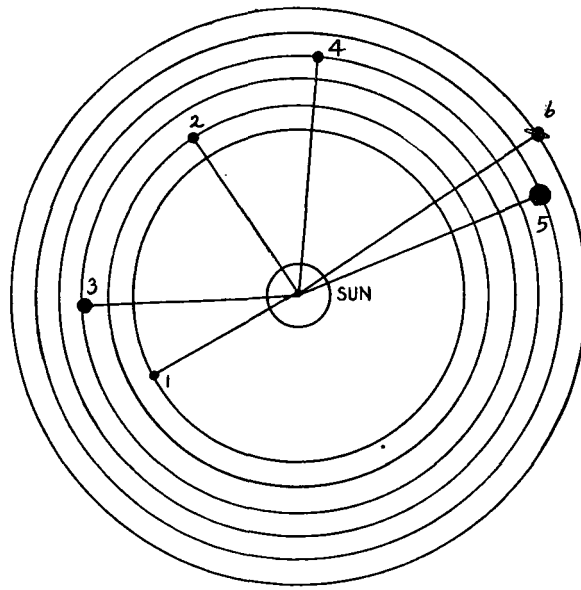
groups died within hours of each other and of the same cause. While inadequate in execution, Brahe was trying to apply principles of what we now call statistical analysis. His approach was sound, even if he did lack the needed mathematical discipline.

Despite his shortcomings and eccentricities, Tycho Brahe was a remarkable man—clever, resourceful and inventive. He devised all kinds of precise instruments to measure angular stellar distances, longitude and latitude. He trained more than forty astronomers and lived in luxury. Counts, dukes and even kings from all over Europe came to visit his "court" and stayed for months, awed by the astrologer's personality and broad knowledge. Tycho presumed to be able to distinguish a sleepwalker by his horoscope, and claimed that somnambulism was more common at the full moon than at any other time. On this point he may have been right. Dr. J. Russell Fields made a similar study two years ago in America and the statistics supported his theory.

This example of Tycho's observational ability shows that he could be objective. He worked fourteen



	°	′
1. MERCURY	205	43
2. VENUS	122	28
3. EARTH	183	12
4. MARS	83	59
5. JUPITER	20	06
6. SATURN	33	15

Helicentric longitude of planets during disturbances on March 24, 1940.

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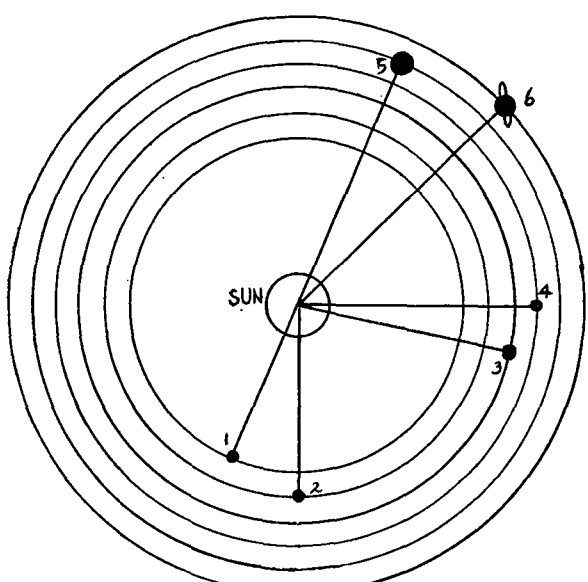
years, made literally thousands of precise measurements and finally experienced the crowning achievement of his life—a catalogue of 777 stars, every one of them a completely new determination. This was the first star catalogue since the days of Hipparchus, the early Greek astrologer-astronomer.

Thus Tycho provided the figures which enabled Kepler to create his new celestial mechanics. There is no doubt that before he succeeded Tycho, Kepler was powerfully influenced by him. Within the two years he spent as Tycho's assistant, Kepler became thoroughly acquainted with the older man's interpretation of every event as the effect of celestial influence.

In view of Kepler's later convictions, it helps to realize that he was subjected almost daily to the Dane's belief in terrestrial-celestial relationships. On the surface, some of his notions were surprising. Tycho actually did predict outbreaks of seemingly motiveless murders, attacks and crimes; he held these events to be caused by the 27⅓ day Lunar cycle.

The Twentieth-Century Nobel Prize-winning chemist, Svante Arrhenius of Sweden, seems to have



	°	′
1. MERCURY	250	21
2. VENUS	273	03
3. EARTH	354	40
4. MARS	2	58
5. JUPITER	69	10
6. SATURN	52	50

Helicentric longitude of planets during disturbances on September 18, 1941.

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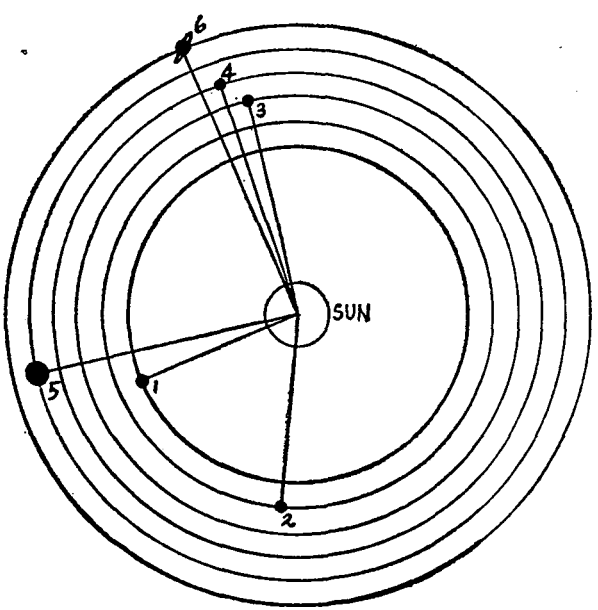
upheld Tycho by proving that ion conductivity in the atmosphere increases the rates of violent crime every 27⅓ days with the Lunar phase change. It would be dangerous to jump to any conclusions solely on this basis, however. It should be abundantly clear that such coincidences had happened before, and that Tycho Brahe had absolutely no conception of atoms, let alone ions!

The relationship between Kepler and Brahe was a volatile combination—it often flared into violent quarrels which invariably resulted in deep remorse. They were like father and son, the latter refusing to lower his sights from the crystal-clear heights of astronomy to the murky depths of astrology. Young Kepler was more interested in the "pure theory" of the time—astronomy—than the "applied science" aspect, astrology.

But several years later—with the avowed purpose of discrediting it once and for all—Kepler undertook the serious study of astrology.

He began by studying the effects of the apogean and perigean passages of Mars and concluded that these passages must have an im-



	°	′
1. MERCURY	204	57
2. VENUS	265	21
3. EARTH	102	01
4. MARS	108	09
5. JUPITER	194	56
6. SATURN	111	05

Helicentric longitude of planets during disturbances on January 3, 1946.

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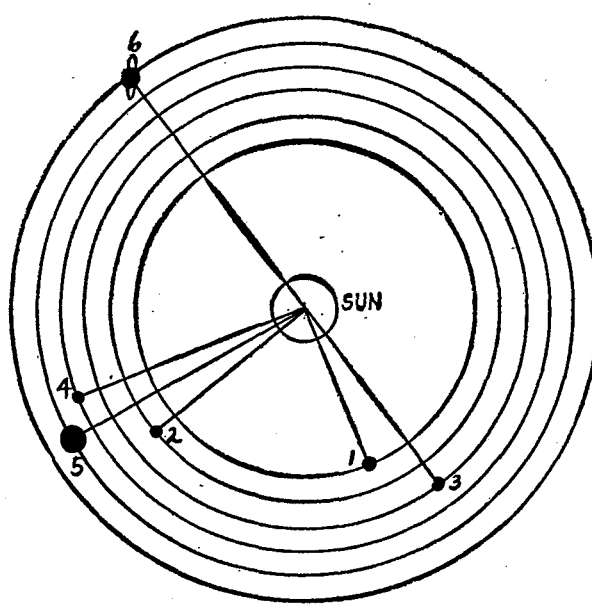
portant connection with business activity because there were always peaks or rises in the German markets at this time. Modern security analysts and cycle researchers seem to have borrowed this idea. Despite scientific opinion to the contrary, several prominent New York brokers use it in stock transactions.

Kepler, whose first wife owned considerable property, became interested in the simple 22½-month cycle of Mars. Probably from a desire to capitalize on his knowledge, he stretched this to include a 23-month "real estate cycle." The fact that he made a few shrewd transactions convinced him that the Mars cycle really worked.

Encouraged and enthusiastic with his success, Kepler plunged into deeper researches. He was forced to rely a great deal on intuition when it came to the cycle of Venus. Eventually he decided that the 7½-month heliocentric period of Venus was vitally significant in the incidence of disease epidemics and in the recurrence of critical phases in the known forms of insanity.

The only similar study in modern times was made by a Dr. Webster in England. Although he reached



	°	′
1. MERCURY	288	45
2. VENUS	234	03
3. EARTH	303	21
4. MARS	199	33
5. JUPITER	210	26
6. SATURN	118	41

Helicentric longitude of planets during disturbances on July 27, 1946.

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the same conclusions as Kepler, it is fair to assume that he'd read Kepler's theory beforehand. In any event, Dr. Webster's research has been discredited on the ground that he is a medic and a cycle expert, not a scientist.

From the foregoing, Kepler concluded that astrology was the study of the "laws of correspondence" existing between celestial and terrestrial phenomena and man.

In all fairness to him however, it should be noted that he was one of the first men of his time to advance the idea that the attraction of the Moon caused the tides of the oceans. Considering the times, this was slightly heretical in itself.

Kepler's earliest work, "*Mysterium Cosmographicum*," was born as a result of his astrological studies; it launched his career. In 1602 he published "*De Fundamentis Astrologiae*" in Prague. Someone managed to destroy half of this work, but the other half was hidden in the observatory of Pulkowa. Early in the Nineteenth Century a German physicist found it, made a translation, and a dozen volumes were printed in Frankfort in 1858. Many present day believers consider Germany as the best source of astrological material.

Johannes Kepler published the first two of his now famous laws in 1609, but it was his weather predictions which originally brought him fame. He predicted the bitterly cold winter in Styermark and the revolutionary disturbances among the Austrian peasantry in 1593.

The publication of his "*Mysterium Cosmographicum*" eventually established his career. He maintained an "astro-weather" diary from 1617 to 1629. This work included his notes, rules, formulae and corresponding planetary configurations. The diary was published by Dr. J. Goad in 1686 in his book, "*Astro Meteorologica*," fifty-six years after Kepler's death.

Actually it was Aristotle who wrote the first known treatise on astro meteorology. This was considered the best authority on the subject until the publication of "*Astro Meteorologica*." Dr. Goad's book was recognized as *the* world authority on weather prediction until modern scientists discarded the idea of planetary influence on the weather, two hundred years later.

In spite of widespread feeling against astrology there is some evidence that it is once again creeping into the main body of science. RCA Communications, Inc., uses an heliocentric form of astrology to predict storms in the ionosphere which garble and destroy short-wave radio communications. These storms are caused by sunspots and solar flares, which RCA's chief weatherman, John H. Nelson, predicts with ninety-three per cent of accuracy. He sets up charts of the planets' positions in relation to the Sun. His earlier work dealt solely with heliocentric

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configurations, but he is now sharpening his accuracy by including geocentric declination effects.

"The encouraging correlation between ionospheric disturbances over the North Atlantic and planetary configurations—particularly of the multiple type—suggest the following deductions:

(1) That the most disturbed twelve-month periods will be those preceding and following configurations of the 0°, 90°, 180° and 270° type between Saturn and Jupiter.
(2) That the most disturbed parts of the periods in (1) will be those in which Mars is close to a configuration of the 0°, 90°, 180° and 270° type with either Saturn or Jupiter.
(3) That the most disturbed parts of the periods in (2) will be weeks when Earth, Venus or Mercury has a configuration of the 0°, 90°, 180° or 270° type with either Saturn, Jupiter or Mars.
(4) That the most severe disturbances of all will come when the combined influence of Mars, Earth, Venus and Mercury are such that all four will be arranged in positions where there will be a great concentration of planetary influence near the 0°, 90°, 180° or 270° points of the Saturn-Jupiter team during the configurations mentioned in (1).
(5) That the least disturbed periods will be those preceding and following periods when Saturn and Jupiter are separated by 120°, the principal disturbances during these periods coming from configurations of the 0°, 90°, 180° or 270° type that the inner planets Mars, Earth, Venus and Mercury make among themselves, or as a multiple with either Saturn or Jupiter.
(6) That the least disturbed periods of all will be those when Saturn, Jupiter and Mars are equally spaced by 120°, the principal disturbances during these periods coming from configurations that Earth, Venus and Mercury make among themselves, or as multiples with Saturn, Jupiter, or Mars. Configurations of the multiple type are less frequent during an arrangement of 120° among these three slow outer planets.
(7) That 60° relationships between planets will also tend to produce "least disturbed periods" since 60° is one half of 120°."

For thousands of years the astrologers have referred to planetary angles of multiples of 90° as the major "aspect," square; this is generally considered a "bad aspect." On the other hand, 120° has always been called "trine" or generally a "beneficent aspect"; 60°, in astrological parlance, is called a "sextile" and is considered good, but not as good as a planetary trine. In astrology however, each planet

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is a specific significator, which works through the astrological "Sign" or constellation, and is further modified by the degree of the "house" in which it happens to be placed.

But the belief in astrology is not confined to single individuals nor even single corporations. Within the past decade the list of large American corporations which availed themselves of the services of a long-range weather forecaster is staggering. A white-haired, genial and convincing old gentleman in northern New Jersey sold monthly weather reports, based on Kepler's methods, to large companies throughout thirty-six American states. General Motors, AT&T, A&P, Sears-Roebuck, Pepsi-Cola, large amusement enterprises and even entire municipalities bought these reports. Dozens of these clients, convinced of the old man's useful accuracy, would gladly pay for his advice today if he would only come out of retirement. Whether the theory is sound or not—the results are!

Kepler's reasoning was that primary weather patterns in eastward transit are continually changing in tensity, latitude and character around the globe in response to planetary and luni-solar phenomena affecting magnetic fields over various terrestrial areas. These fields supposedly remained dormant until "sparked" or "triggered" by conjunctions or "magnetic angles" to sensitized points in key charts erected for any required points of observation.

Reversing his original position of "pure theory" Kepler attempted to convert astrology into an experimental and practical science. He kept statistics of the "biggest possible objectivity." Using his own rules of astrology, about forty per cent of his findings were unfavorable. Yet he persisted in recalculating more than a thousand years of error.

That which he discovered through his astronomical studies went into the correction of his astrological files. With his horoscopes as a basis, he allegedly wrote descriptions of relatives, friends, and of himself with great insight and detail: "In me, Saturn and the Sun work together in their sextile aspect . . . to toil up mountains, to stumble over fields and rocky slopes—these things delight me. My destiny is similar: where others despair, money and fame come to me, though in modest measure. I meet opposition, and in the distant future my ideas will continue to meet opposition."

He was so right.

"True astrology," he asserted, "is a holy testimony to God's glorious works, and I, for my part, do not wish to dishonor it."

Kepler devised a different form of astrology than that which was used by traditional astrologers: "Observe this: if today two planets stand at 89 degrees from one an-

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other, nothing will happen in the air. But tomorrow, when the full square of 90 degrees is reached, a thunderstorm will suddenly arise. The effect, therefore, does not come from a single star, but from the angle, from the harmonious segment of the circle."

His premise also maintained that the "rays" of a planet exerted some mysterious effect upon the Earth and all upon it. The rest he left to the geometrical principle, the reflection of the "Spirit of God."

Formerly he had tried to fit the five regular solids in between the spheres of the planets. Now he pointed out that the regular polygons which could be constructed within a circle yielded the astrologically important planetary angles: square, trine, conjunction, opposition, quadrature, sextile aspect, et cetera. Kepler demonstrated that these angles were related to the total number of degrees in a circle in the proportions of 1:2, 2:3, 3:4, 4:5, 5:6, 3:5, and 5:8. If he straightened his circle into a violin string, the astrological angles would correspond to the different divisions which yielded harmonics.

"The music God made during the Creation," he stated, "He also taught nature to play; indeed, she repeats what He played to her."

"I have touched mountains," he said when he finally succeeded in demonstrating the mathematical relationship between the distances of the planets and their velocities. "It is tremendous, what smoke they belch forth!"

With dedication and self-denial, Kepler calculated Ptolemy's orbit of Mars and found an error of a mere 8 minutes of arc. "Those eight minutes," he claimed afterward, "opened the way for me to renew the whole of astronomy."

The most amazing thing about his discovery of the law of areas was the fact that he totally lacked the mathematical tools which could finally prove his findings—or even *demonstrate* this law! But credit to him, it worked!

As astrologer to Emperor Rudolph II, Kepler cast horoscopes of Augustus, Mohammed and Turkey's sultan. He corresponded with Galileo. After acquiring a telescope of his own, he studied the surface of the Moon for weeks—and went into ecstasies of joy. He fulfilled a boyhood dream by writing one of the first science-fiction stories in history; a voyage to the Moon and back. The grandiose title of this little book was, "*Somnium sive Opus Posthumum de Astronomia Sublunari.*"

Considering what was then known, this remarkable piece of work proves his ability at intuitive reasoning and deduction. He simply took for granted that both the Earth and the Moon had gravitational fields, yet it was more than two generations before Newton.

But any modern physicist could have predicted that Kepler would

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utterly fail in his search for a rational energy basis for celestial influence on either man or the weather. Kepler, however, persisted. He was adamant in his conviction that astrology rested its claim to attention on nothing other than such points of intersective reference as the equinox, the lunar and planetary nodes, the intersection of the meridian and the ecliptic, the horizon and the ecliptic, and similar points.

This concept did not die with him. Isaac Newton tried to prove the same thesis. Then in 1907, George Sutcliffe, an American scientist, became obsessed with the idea. He advanced the notion that the planets affected the earth by electrodynamic induction. Because he predicted several large earthquakes, he received some notoriety.

Newton, who followed Kepler's trail, believed there was profound logic to the latter's correlation between crystals and "world lines." He believed that because these points of intersection of "world lines" *did* change—due to precession, orbital and diurnal revolutions—and because man, by his geographic change, altered the couplings of his "personal field" with that of the planets and stars, there occurred all the changes men designated as events.

Failing to prove anything with crystals or horoscopes, Kepler consoled himself with his beloved "The Harmony of the World."

The internationally famous Greenwich Observatory was erected in 1675 by order of the King Charles II. Its popular name became "Flamstead House" after John Flamstead who was the first astronomer-royal. This astronomer was a prolific astrologer who erected a chart of the heavens for the very moment of the "birth" of Greenwich Observatory. In fact, he postponed the laying of the foundation stone until the arrival of an astrologically propitious moment.

Flamstead deduced from Kepler's proof of elliptical orbits of the planets that they revolved around two centers, or foci—the Sun occupying only one of them—"the two foci compel us to realize that not only do we have a physical center, the Sun, but an unmanifested and spiritual center, also," he wrote, "and that neither is sufficient in itself to explain the power which anchors the Solar system in space, nor the source from which we get our life, our being, and all that we are able to respond to. As to the combined effect of the two centers, the physical and nonphysical, the Sun, and an Euclidian point, the knowledge of scientists is entirely unable to deal with or explain."

The other foci around which the planets revolve is merely a mathematical point reflecting the center of gravity of the Sun and each planet—thus the elliptical orbits . . .

Galileo shared his enthusiasm

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for telescopes and experimental physics with Kepler, with whom he corresponded. Florence was the heart of European culture, so his early environment was far more brilliant than his Bavarian friend's background. As professor of mathematics at the University of Padua, Galileo began seeking the truth in nature.

The Italian scholar rebelled at dogmatic ideas and at those who believed that truth could be found in old manuscripts. It isn't clear where he began probing into ancient prophecies and astrology.

At the birth of each of his children Galileo cast their horoscopes. He was consulted regularly by relatives, friends and colleagues for interpretations of their horoscopes; he also wrote a great deal of astrology under a pen name.

He believed that something in the air changed with the geometric relationships of the Earth and the planets. This "something" obviously caused changes in the behavior and emotions of all living creatures—especially man. Galileo struggled to force this theory into the body of astrological knowledge by claiming that a sharp rise in violent crime was caused by the Moon's influence on the atmosphere.

There are those who seek to justify this idea by citing the example of the "Foehn" in Switzerland. This is a warm dry, wind, which brings an explosion of extreme restlessness and senseless crime. And along the northern Mediterranean, broad-minded courts impose exceptionally light sentences for crimes that take place during the "Sirocco," a wind that blows from the Libyan desert and brings in its wake a sharp upswing in crime rates.

Reputable scientific surveys have indicated that the violent disturbing effects of such "evil winds" are directly attributable to fluctuations in the ion count, which are caused by Lunar and Solar effects on the atmosphere.

No doubt Galileo would have been delighted to see his theory confirmed by a three-year study of ionization effects concluded in Philadelphia in 1961. The American Institute of Medical Climatology, which sponsored this city-wide survey, flatly stated that electrical charges in the atmosphere affect the way we think, feel and behave. These positive and negative ions in the ionosphere are influenced by solar flares.

Dr. William Peterson, a professor at the University of Illinois, in an epic tome, "The Patient and the Weather," also found that positive and negative ionization of the air is very significant to health and psychosomatic function.

Dr. Peterson, as well as a large number of other independent investigators, found that the sunspot cycle, which Nelson has shown to correlate to planetary positions, has "important effects" on human beings.

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Then in 1642, when the Prisoner of the Inquisition closed his blind old eyes forever, a baby named Isaac Newton first saw the light of the world.

By the time young Newton began to study mathematics, the schism between astrology and astronomy was complete. He chose astrology as his life work. But eventually, like his predecessors, he was virtually forced to take up the study of astronomy. It was the nerve fiber, tissue, heart and brain, without which astrology could not exist. Newton realized this only too clearly, but he insisted on a Yin and Yang explanation: astronomy was the body, astrology the soul.

He accused his colleagues of thinking in terms of material and efficient causes and neglecting final and formal causes. He accused his staunchest supporter, Edmund Halley of comet fame, of having lost his sense of the "dual character of truth and reality, of interior and exterior—or outward expression as a manifestation of inner cause."

Halley, a true scientist, who was morally and financially responsible for the publication of Newton's laws of gravitation, once mildly asked why Newton believed in such nonsense.

"I do not believe in a universe of accidents," Newton retorted. "At any rate, I have studied the subject; you have not."

Yet Newton towers above all other scientists. Why? Even he admitted a great debt to his predecessors. "If I have seen farther than others, it is because I have stood upon the shoulders of giants."

Why shouldn't he? After all, these "giants" were also astrologers.

Kepler had had some success in predicting weather and earthquakes. Newton attempted to duplicate this feat and also made a few successful predictions. No one was more surprised than he. The method he used was completely wrong—even from an astrological viewpoint, because he employed some ancient Arabian mathematical points in his calculations which "did not exist in reality." One of these points supposedly moved in an eighty-four-year orbit around the Sun and "caused" earthquakes when it was within 10° of the meridian!

A German geophysicist, Dr. Rudolph Tomaschek of the University of Munich, examined one hundred thirty-four severe earthquakes—from 1904 to 1952. He showed that during each of these quakes—above an index of 7.75—Uranus was within plus or minus 15° of the upper or lower meridian. Astrologers all over the world rejoiced at this because the Arabian mathematical point coincided perfectly with the motion of the planet Uranus. It is astronomical history that Newton could not have known of the existence of Uranus, which wasn't discovered until 1871 by Herschel.

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To suggest that the Arabs may have known of it is too ridiculous to contemplate. Furthermore, the apogean and perigean recurrence of Uranus in its orbit is forty-two years.

No doubt Newton was dazzled and baffled by his success. He began studying social prominence in the various professions, longevity, and even medical astrology. He came to the conclusion that the Moon was largely influential on the mind and the deeper wells of consciousness.

Newton insisted on exploring the possibilities of the Moon's influence on weather, crops, mental illness and the psychology of the masses. Moon madness is more contagious than any other mania. Even the staid *Journal of Mental Disease* claims that the solar-lunar or synodic cycle of 29½ days has a marked "effect" on mental illness.

There *is* evidence that the 13-year sunspot cycle is reflected in the rings of trees. And Dr. Harold S. Burr of Yale has found correlations between lunar influence and micropotentials in trees and plants.

Drs. Leinex and Gibbs report in the *Journal of Heredity* that brain wave cycles actually do correlate with the phases of the Moon. And Dr. Leonard J. Ravitz of the Veterans Bureau Hospital in Downey, Illinois, detected mood changes in people analogous to the Moon's phases. On the distaff side, Dr. Hannah Hendrick of the United States Naval Observatory, in her study of mental institutions, noticed that women were more likely to enter a mental hospital during a Full Moon; men on the second day after the New Moon.

Newton violently disagreed with the growing conviction of astronomers that the Copernican theory killed astrology—because astrologers maintained that the Earth was the center of the Solar System. Newton used geocentric longitudes of the planets as they related to the Earth as a point of perspective. He insisted that Ptolemy's astrological rules, laid in 155 A.D., were merely his way of dealing with relativity.

Newton was an excellent historian as well as a mathematician, but his researches were devoted too much to ancient prophecies, and he knew the terminology of every occult science available to him. Consequently he became bitterly angry at some of his contemporaries who, while outwardly glorifying Copernicus, attacked his good sense because he was an astrologer.

Newton studied Hermes and collected an entire library on alchemy as well. He wrote over 500,000 words on the subject which only now are being put into publishable form. He also wrote over 1,000,000 words on theology and ancient mysticism.

It seems doubtful that Newton himself understood the significance of some of his work. His ideas on the phase changes of civilization

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were remarkable. He claimed, for example, that his calculations showed a powerful but subtle influence on all cultural changes; these changes occurred every 250 years. His basis for this was the mathematical points of the ancient Arabs. In truth, the ancient Arabs, from whom we inherited algebra, possessed a far superior science than anything existing in Newton's time. But their system included the astrology of mathematical points. Although the true origin of these points remains a mystery even today, Newton used them without hesitation.

It is curious that in Spengler's "Cycle of Culture and Civilization," he cites the 248-year anomalistic cycle of Pluto as most significant. Pluto's perihelion cycle correlates to and defines psychocultural phase changes occurring at intervals of about 250 years—in years divisible by 250—500, 750, 1000, 1250, 1500, 1750 and 2000, both B.C. and A.D.

Two other investigators, Lamprecht and J. H. Bradford, support Spengler's thesis. But there is nothing to indicate that Newton could have known anything about a tiny planet existing as far out as Pluto.

He was on familiar ground with Hindu and Chinese history however, especially with ancient prophecies and Eastern astrology. He extrapolated on ancient Chinese reports of a Jupiter-Saturn recurrence cycle and concluded that the whole period is 794.37 years—or 40 "beats" or synodic periods. The recurrence of this cycle in the tropical zodiac is within less than $-1°$ of the starting point.

In and of themselves cycles prove nothing. But cycle investigators are forever making correlations between planetary cycles and everything under them.

In this case, Newton's Jupiter-Saturn cycle was detected in history by two independent investigators, Arnold J. Toynbee and Dr. J. S. Lee of China. Dr. Lee's collaboration with Lin Yutang and Hu Shih showed that his study was a quantitative one of Chinese internal warfare over 2150 years—from the Ch'in and early Han Dynasties of 221 B.C. to 1930 A.D. He traced nearly three full cycles whose mean length was exactly 794 years.

And Toynbee established his cycle from nonquantitative empirical studies of many societies. In his "Regional Civilizations," and in "A Study of History," the average length of his tables is about 795 years. This pleases the astrologers, who traditionally accept the cycles and conjunctions of the two largest planets as the primary indicators of political and dynastic changes.

During the past 120 years there has been a 20-year recurrence of a Jupiter-Saturn conjunction in one of the astrological "earth" signs. It is *coincidental* that each American president in office at the time of these conjunctions either died or

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was assassinated before leaving the Presidency.

William H. Harrison, elected in 1840, held office at the time of a Jupiter-Saturn conjunction in Capricorn and died of pneumonia in 1841.

Abraham Lincoln, elected in 1860, held office during the following Jupiter-Saturn conjunction in Virgo, another "earth" sign. He won a second term in 1864 and was assassinated in 1865.

James A. Garfield, elected in 1880, held office during a Jupiter-Saturn conjunction in Taurus and was assassinated in 1881.

William McKinley won his second term in 1900 during a conjunction of Jupiter and Saturn in Capricorn. He was assassinated in 1901.

Warren G. Harding, elected in 1920 at the following Jupiter-Saturn conjunction in Virgo, died in office in 1923.

Franklin Delano Roosevelt, elected to his third term in 1940 during a Jupiter-Saturn conjunction in Taurus, went on to win his fourth term in 1944, but died in office in 1945.

John F. Kennedy was elected in 1960 at the time of a Jupiter and Saturn conjunction in Capricorn.

Admiral Dewey, General Nelson and President Grover Cleveland consulted astrologers regularly. Mark Twain swore by astrology all his life. He said he was born under Halley's comet and expected to die with its return. He died according to his own prediction.

That the great Swiss psychiatrist, Carl G. Jung, was intrigued by astrology is clearly evident in his writings. Astrologers have always claimed that a comparison of horoscopes of married couples, or couples about to be married will determine actual or future harmony or inharmony—based on the psychological interpretations of planetary aspects. In some cases, these astrologers may even venture a guess as to whether a couple is married or not.

Jung began using horoscopes to examine the planetary aspects in the charts of 483 married couples—966 persons. He used another large group of single couples who hadn't met, as his control group.

His remarkable conclusion was, "The statistical material shows that a practically as well as a theoretically improbable chance combination occurred which coincides in the most remarkable way with traditional astrological expectations. That such a coincidence should occur at all is so improbable and so incredible that nobody could have dared predict anything like it. It really does look as if the statistical material had been manipulated and arranged so as to give the appearance of a positive result."

Any thinking individual is aware of his absolute freedom from all influences, both terrestrial and celestial, with certain minor exceptions, of course. But the scientists must exercise care about which exceptions to admit. Modern phys-

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iologists are now claiming that man is a completely responsive element in the cosmos. He interacts with his environment, both terrestial and celestial.

If nothing else, the devotees of astrology are persistent. Over the past two decades so many statistics attempting to prove celestial influence on human beings have been compiled that it would take two volumes just to list them. The remarkable aspect of this development is the large number of scientists now actively engaged in astrological research.

The only science writer ever to win a Pulitzer Prize for his work, John J. O'Neill, condemned astrology as totally unscientific and completely irrational. As Science Editor for the New York *Herald Tribune*, O'Neill deviated from his main interest, astronomy, in order to avail himself of the heavy anti-astrological ammunition within the study of astrology itself. In so doing, rather like Kepler, he came to believe in it.

In a letter of support for an astrologer debating Dr. Roy K. Marshall, then Director of the Fels Planetarium, astronomer O'Neill said, "I speak as a scientist who does not deviate to the slightest degree from the most rigorous adherence to the highest standards of demonstrated evidence in support of truth. I do deviate from the average attitude of scientists in that I place far more reliance on direct observation of nature than I place on textbooks and human authorities . . . Astrology is one of the most important fields for scientific research today, and one of the most neglected. Astrology, properly defined, is the science of the relationship of man and his celestial environment; it is the accumulated and organized knowledge of the effect on man of the forces reaching the earth from surrounding space . . .

"There is absolutely nothing unscientific about engaging in research in this field, and no stigma of any kind should be associated with it in the mind of any scientist or layman . . . Scientists today cannot look down on astrology; instead, they must raise their eyes to take in the higher horizons that astrologers have preserved for them . . . Attacks on astrology, without previous extensive investigations by competent individuals must, from now on, be regarded as a very antiquated, unscientific practice closely related to witch hunting, and must be correctly diagnosed as a symptom of professional paranoia on the part of the individual doing the attacking."

Webster defines *coincidence* as "A group of concurrent events or circumstances, or one of them, remarkable from lack of apparent causal connection." Another way of putting it is, "A coincidence is an effort to avoid reason." All things that happen are effects, and every effect has a primal cause.

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Every cause presupposes some intelligence.

Therefore, we must avoid reason at all cost.

But just for the hell of it let us proceed, as Kepler says, to the summit. Let us see if the planets *could* have any effect on human beings:

1. Solar flares and sunspots have a powerful effect on the Earth's weather, particularly on the ion concentration in the atmosphere.

2. Electrical atmospheric charges affect plant, animal and human health and disease conditions.

3. The American Institute of Medical Climatology proved that positive and negative ions in the atmosphere definitely affect the way we think, feel and behave.

4. It is scientifically known and accepted that oxygen is, in certain respects, magnetic. So Solar magnetic fields and sunspots can affect the Earth's atmosphere magnetically as well as thermally.

5. John Nelson of RCA proved that the heliocentric angles of the planets trigger Solar flares. Now he includes the Moon, Sun and planets to obtain very sharp geocentric declination effects.

Now if these harmonic planetary positions affect Solar magnetic field phenomena, it is entirely probable that they also affect the Earth's magnetic field patterns. It is solidly established that affected Solar phenomena affect the Earth, its atmosphere and all its inhabitants.

Therefore, "as any fool kin plainly see, ah kin see" that the harmonic angles formed by the planets damned well do affect us pore mizzuble hoomins! ■

Statistics Are Wonderful

Dr. John R. Pomeroy points out that, contrary to uninformed public opinion, traveling by rocket capsule is the safest of all methods of transport. It can be shown statistically that rocket travel has an unmatched and unsurpassable safety record of zero fatalities per million passenger miles.

And while it is impractical on short-run service, on long-haul freight it is cheaper, per ton-mile, than any other form of transport. It may have cost a megabuck to launch Echo I, but it, for example, has been traveling steadily at about 18,000 miles per hour for over a year, while some of the massive Soviet vehicles show even lower costs per ton-mile.

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Good Indian

This may not be science fiction, but if it isn't, it should be, and anyway it's fun!

by Mack Reynolds

Illustrated by Douglas

■ Mortimer Dowling opened one eye accusingly and said, "Miss Fullbright, I thought we had a standing agreement that I was never to be bothered while in conference."

Millie said, "Take your feet off the desk you'll scratch it. Am I or am I not your receptionist?"

"You am. Now go away. It was very drunk out last night."

"A receptionist recepts and . . ."

Mortimer Dowling opened the other eye, too, and interrupted. "No she doesn't," he said severely. "You don't do enough crossword puzzles. A *recept* is an idea formed by

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the repetition of similar percepts, as successive percepts of the same object. A receptionist does something else. I forget what. Go away. I'm tired."

". . . And when someone comes into my office asking for an appointment to see the Director of the Department of Indian Affairs, then it s my duty to so inform you."

He closed both eyes and snorted. "Don't be ridiculous."

"Three of them," Millie said definitely.

Mortimer Dowling said sleepily, "Three what? Why don't you go away? Go away and do a crossword puzzle or something."

"Three Indians to see you, sir," Millie said formally

The head of the Department of Indian Affairs opened both eyes again and said severely, "Miss Fullbright, I am in no mood for jest. You know very well that there is no such thing as three Indians. The last Indian died almost ten years ago. The President proclaimed a day of national mourning. I made a speech. It was all very sentimental. Are you going away or not?"

Her mouth tightened. "They say they're Indians. And they look like Indians. I've seen pictures of Indians."

Mortimer Dowling blinked. "You're serious?"

"Of course, I'm serious "

"Three men in the outer office, and they say they're Indians?" A certain tremor was coming into Mortimer Dowling's voice.

She nodded definitely.

"Good Heavens," said the Director of Indian Affairs. "For nearly fifteen years I've held this job, and my father before me. By the terms of the final Indian treaty there must always be a Department of Indian Affairs so long as the United States shall endure, the original idea being that the Indians would always have somewhere to go to find justice. It never occurred to those who compiled the treaty that the Indians would eventually blend into the rest of the population. The last bit of business conducted by the department was almost half a century ago. Miss Fullbright, do you realize what you're saying? *There's actually something for me to do!*"

"Yes, sir," said Millie, overwhelmed by it all. "What shall I tell them?"

Mortimer Dowling sat up straight behind his desk, businesslike. "Now, just what was it they wanted?"

"An appointment."

He thought about that. "Well, we should give them one, Miss Fullbright. Yes, indeed. An appointment."

Millie was impressed by the new aggressive mien of her superior. "Very good, sir," she said.

"Mark it down on the calendar, Miss Fullbright."

"Yes, sir. When do you wish to make this appointment, sir?"

He thought about that. Finally, decisively, "Now."

"Right now?"

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"Right now. They might go away and not come back."

"Yes, sir."

There were three of them all right and they came in assorted sizes ranging from a six-footer pushing three hundred pounds to a five-footer pushing ninety pounds. The one in the middle averaged out neatly.

Mortimer Dowling shook hands with enthusiasm. "You have no idea how pleasant it is to meet you chaps," he said. "Our records show that the last full-blooded Indian died ten years ago. Where have you been keeping yourselves? Miss Fullbright, chairs for these gentlemen."

When they were seated, Mortimer Dowling looked them over happily. They were Indians all right, all right. You could see they were real Indians.

Mortimer Dowling said, "Yes, sir, a real pleasure. Now then, what can we do for you? The Department of Indian Affairs places its full resources at your disposal, gentlemen."

The one in the middle said, "We're Seminoles. We've come to sign a treaty."

Mortimer Dowling's face went blank. "Seminoles?" he said. "A treaty?"

They gave him one concerted nod, lapsed back into frozen-faced silence. Oh, they were Indians all right.

Mortimer Dowling cleared his throat. "Look here, the government of the United States cleared up all its Indian difficulties over a century ago. We signed final treaties with every tribe."

"Except the Seminoles," the one in the middle said. "We represent the Seminoles." He indicated his hefty companion to the right, "This is Charlie Horse and I'm Fuller Bull, and . . ."

"You're *what*?"

"Who, not what," the Indian said strictly. "I'm Fuller Bull."

"Oh," Mortimer Dowling said. "I thought you said—Never mind." He looked at the small one and tried to place the conversation back on a lighter level with a *bon mot*. "And I suppose this is Chicken Little."

"And this is Osceola the Eighteenth," Fuller Bull said. "We call him Junior."

Junior spoke up for the first time. "For your information, the three of us took our LL.D.s at Harvard. We carry powers of attorney for all fifty-five of the other surviving members of the Seminole tribe."

"*Fifty-five?*" Mortimer Dowling was astounded. "You mean there are fifty-five more of you?"

"Correct," Charlie Horse said. "And we've come to sign a treaty between the Seminole Nation and the United States of America."

Already Mortimer Dowling was beginning to feel a bead of very cold sweat forming on his forehead. He said anxiously, "Miss

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Fullbright. Please. The file on the Seminole Indian Nation."

"Yes, sir," Millie said. She scooted out. Came scooting back in mere moments, a thin file held in both hands. She put the file before him.

Mortimer Dowling renewed his information on the Seminoles quickly. Scanned paper after paper. Emitted occasional grunts. Finally he looked up at them in satisfaction.

"Now," he said definitely, "I don't know what your game is, but it won't work. More than a century ago, the whole world went through a period of settling its difficulties with its minorities. World opinion grew so strong that not a major power on earth dared do otherwise. Why, even the Sino-Soviet Complex freed its satellites—of course, by that time there was nobody left in the satellites except good commies, so they immediately applied for readmission. However, that's beside the point. The point is that the United States reviewed every dealing we had ever had with every Indian tribe. Settling all the Indian questions beggared the United States treasury, but we satisfied them all—every tribe, every member of every tribe." He let his eyes go ceilingward for a moment. "As I recall, the hardest to please were the Delawares. There were only three hundred seventy-five of them left, and they got a million dollars apiece."

"Peanuts," Charlie Horse said.

"I beg your pardon?"

"Peanuts," said Charlie Horse.

Mortimer Dowling thumped the papers before him with an emphatic fingertip. "When we attempted to contact the Seminoles we found there were none to contact. They were all gone. The only ones we could find were along the Tamiami Trail and at Silver Springs selling baby alligators and souvenirs made in Japan to the tourists. It turned out they were all Armenians, making an honest living. No Seminoles left."

"We went underground," Junior said.

Mortimer Dowling gaped at him. "What?" he said.

"We went underground," Junior told him. "We realized that the longer we could put off our final settlement with the government, the better off we'd be. Look at history. The great powers start off by butchering the aborigines of the countries they conquer. Then, as time goes by, their conscience begins to hurt and they make wards of those that are left. More time goes by and they begin to wax really sentimental. They seek out the very last survivors and load them with honors, with privileges, sometimes with positions superior even to their own citizens. Look at the British and the Tasmanians, the New Zealanders and the Maoris, the Swiss in Switzerland."

Millie cleared her throat. "What happened to the Swiss?"

"Finally there were so many more tourists in the country than

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Swiss that they began to thin out. Like the Chinese used to do, with invaders, only sort of in reverse. The tourist hordes interbred with the Swiss until finally you couldn't find a full-blooded one. The last man who could yodel died in Berne, twenty years ago."

Mortimer Dowling said severely, "Let's get back to the point."

"The point is," Charlie Horse said, "that the United States has no treaty with the Seminole Indian Nation. We didn't sign up when everybody else did. We realized the tribe would benefit more if we hid out, kept secret our existence, put off signing for a full century."

There was another bead of sweat on Mortimer Dowling's forehead.

He said weakly, "I assume you have proof, that you can prove that your fifty-eight Seminoles are all full-blooded Indians?"

Junior said, "We've planned this, remember, for a whole century. We've studied every aspect. There are no loopholes by which you can escape. The United States is the only nation on earth that has not settled its problems with all its minorities. You can imagine the impact of public opinion upon you, if this hits the world's headlines."

Mortimer Dowling said hoarsely, "I have before me, the treaty we had prepared a hundred years ago. It offers every Seminole one hundred thousand dollars to settle all claims against the United States."

Fuller Bull chuckled his sarcasm. Junior and Charlie Horse didn't even bother to do that.

Mortimer Dowling said, "I'll up it. I'll promise you the same as the Delawares got. A million dollars apiece for every man, woman and child in the tribe."

They gave him the oatmeal look.

Mortimer Dowling said desperately, "What do you *want*?"

"Florida," said Junior.

"Florida!"

"Florida," Junior said. "We owned it originally and we've never signed it away."

"Do you realize that half a billion people now live in Florida? Do you realize how much money the citizens of this country have invested in the Florida peninsula in the past three centuries? Why the bridge to Havana alone—"

"We're going to make it a toll bridge," Fuller Bull said with satisfaction.

"And we're going to confiscate every house, every orange tree, every motel, in the State," Charlie Horse added. "I get Miami."

"Miami?" Mortimer Dowling repeated, trying to hold on to reality.

"That's my share," Charlie Horse told him.

"Good Heavens," Mortimer Dowling said.

"We're going to make very white man move out of the State," Charlie Horse wound up, with satisfaction.

Mortimer Dowling blurted, "You'll never get away with this. It's impossible."

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Fuller Bull said darkly, "If necessary, we'll take our case to the Reunited Nations."

"The RN?" Mortimer Dowling said in despair. "We wouldn't stand a chance. There's not a country in the RN that hasn't already cleared itself of every taint of colonialism and imperialism. Why, the very expressions have become bad words."

The three Seminoles were smug.

Mortimer Dowling looked at his watch. "See here, gentlemen, let's not be hasty about this."

"So who's being hasty?" Junior said. "We've waited a hundred years for this moment."

"Well, see here, we needn't rush into things. It's time for lunch. Will you gentlemen be my guests? Ha ha, on Uncle Sam, of course. Do you realize this will make quite a precedent? In my fifteen years as head of this department, I've never before had the occasion to submit an expense account."

The three Seminoles exchanged glances.

"Why not?" said Junior.

In the morning, Mortimer Dowling opened one bloodshot eye and said, "Miss Fullbright, please go away. I'm dying."

Millie said, "Take your feet off the desk. Aren't you ashamed of yourself?"

"No. Go away. I need rest."

"Just look at yourself," Millie said disgustedly. "The first time in fifteen years at this job you get something to do, and what happens? You blow up. Instead of trying to figure out an answer, you go get yourself stoned. Absolutely stoned."

Mortimer Dowling grunted. He pointed with his finger at an official looking document lying on the desk. "Do you see that, Miss Fullbright? One of the most brilliant pieces of work done by an American official in the past century."

"Heavens to Betsy, the treaty. And all three of their signatures on it. How in the world did you ever—"

Mortimer Dowling allowed himself a self-satisfied leer. "Miss Fullbright haven't you ever heard the old saying *The only good Indian is a dead*—"

Millie's hand went to her mouth. "Mr. *Dowling*, you mean . . . . you put the slug on all three of those poor Seminoles? But . . . but how about the remaining fifty-five of them? You can't possibly kill them all!"

"Let me finish," Mortimer Dowling growled. "I was about to say, *The only good Indian is a dead drunk Indian*. If you think I'm hanging over, you should see Charlie Horse and his wisenheimer pals. Those redskins couldn't handle firewater back in the old days when the Dutch did them out of Manhattan with a handful of beads and a gallon of applejack and they *still* can't. Now, go away and do a crossword puzzle, or something." ■

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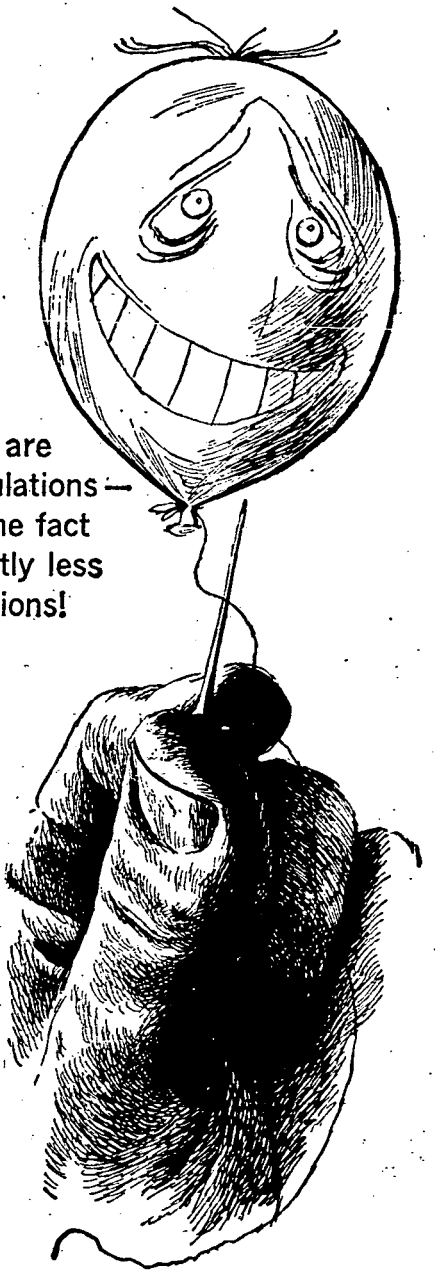
The Professional Approach

The trials of a patent lawyer are usually highly technical tribulations — and among the greatest is the fact that Inventors are only slightly less predictable than their Inventions!

by Leonard Lockhard

Illustrated by Schoenherr



■ "Sometimes," said Helix Spardleton, Esquire, "a patent case gets away from you. As the attorney in the case, you never quite see it the same as everybody else. You stand isolated and alone, unable to persuade the Patent Examiners, the Board, the courts, possibly even the inventor, to accept your view of the case. Nothing you do or say matches anyone else's thinking, and you begin to wonder what's the matter with everyone."

I nodded. This was my favorite time of day. It was early evening in Washington, D. C., and my boss, Helix Spardleton, patent attorney ex-

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traordinary, was relaxing. His feet were up on one corner of his desk, his cigar was in the Contemplation Position, and the smoke curled slowly toward the ceiling. His office was a good room in which to relax. It was filled with fine, old, well-scratched furniture, and the walls were lined with books, and there was the comfortable picture of Justice Holmes on the wall looking down with rare approval on what he saw. Susan, our secretary, had made the last coffee of the day, and had kicked off her shoes the better to enjoy it. The three of us just sat in the deepening dusk, and talked. We didn't even turn on a light. It was a shame I wasn't paying close attention to Mr. Spardleton.

I said, "Yes, I know what you mean about other people's not seeing things the same way you do. I've seen something like it at work with some of my friends just before they get married. They think their brides are just about the most beautiful women in the world, when they are really quite homely—wouldn't even hold a candle to our Susan here."

Mr. Spardleton looked at me and then at Susan, and Susan looked at him and then at me in that sober wide-eyed way she has, and then they looked at each other and smiled. I guess they realized that I had said something pretty funny.

Mr. Spardleton said, "I understand why you think of the situation in terms of brides, but I always think of it in terms of a proud father who sees nothing but perfection in his newborn son."

"Yes," I said, "that's a good way to put it, too."

"There are," he continued through a cloud of gentle smoke, "two different ways in which a patent case can get away from the attorney. The first doesn't happen very often, but when it does it has a tendency to set the world on fire. That's the case that has true merit to it—high invention, if you will—but the invention is so subtle that nobody can see its importance. Only the attorney who wraps the case around his heart can appreciate its vast potential. He goes through the prosecution before the Patent Office and possibly before the courts shouting high praises of the invention, but all the tribunals turn a deaf ear. Sometimes the attorney finally reaches Nirvana; the invention comes into its own. It shakes the world, just as the attorney had always known it would."

I nodded and said, "Elias Howe and his sewing machine, McCormick and his reaper, Colt and his pistol." Mr. Spardleton had taught me well.

"The other way is more common," he continued. "There the attorney never sees the case in its true light. He is blinded by something in it and thinks it is greater than it is. He wastes a lot of time trying to persuade everybody that this very ordinary invention is the wonder of the decade. He thinks of the invention the way a father does of a wayward son—he sees none of its faults, only its virtues, and he magnifies those."

I shifted into a more comfortable position in my deep chair. Mr. Spar-

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dleton must have thought I was going to say something. He looked at me and added hastily, "Or rather, as you'd have it, the way a bridegroom looks at his prospective bride. That better?"

"Oh yes. Those fellows are really blinded. They just can't see anything the way it really is."

Mr. Spardleton said, "Most patent attorneys are unable to tell the difference between the two ways a case can get away from them, once they get caught in it. They always think that nobody else agrees with them because nobody else understands the case. It is quite a blow when it turns out that they are the one who has been wrong all along. Yes, sometimes an understanding of the facts is as difficult as an understanding of the law."

"Yes," I said sleepily. "Sure must be."

If I had known better that evening, I would never have allowed myself to get so sleepy. I should have listened for the meaning in Mr. Spardleton's words instead of merely listening to the words themselves. I have seen Patent Examiners act that way—they hear the words, but the meaning does not come through. We locked the doors and went home, then. How I wish I had listened!

Dr. Nathaniel Marchare is unquestionably the greatest organic chemist the world has seen since Emil Fischer. His laboratories in Alexandria, Virginia, constantly pour out a host of exceedingly important inventions. The chemists, physicists, physical chemists, and biologists who work under him are all dedicated men and women, gifted with that scientific insight that so often produces simple solutions to great problems. Dr. Marchare and his people are the principal clients of the firm of Helix Spardleton, Patent Attorney, and as such they are very important to me. Nevertheless, I always get a queasy feeling in my stomach when Dr. Marchare excitedly calls up Mr. Spardleton, and Mr. Spardleton turns him over to me.

Dr. Marchare is a very nice person, not at all mad as people are prone to say. He is tall and gaunt and slightly wall-eyed, and he seems to live in a great, flopping laboratory smock, and his hair is always wild, and he seems to look around you rather than at you, but he is a very nice person and not at all mad. His main trouble is he does not understand the workings of the United States Patent System. After I have explained to him the operation of the Patent Law on some particular situation, Dr. Marchare frequently begins to mutter to himself as if I were no longer in the same room with him, and I find this most discouraging. As if this were not bad enough, many of Dr. Marchare's scientists have acquired the same habit.

It was a bright fall morning when this particular call came through. I hadn't heard the phone ring, nor did I hear Mr. Spardleton answer it in response to Susan's buzz. But some sixth sense brought me upright in my chair when I heard Mr. Spardleton say, "Well, how are things out in the

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Washington suburbs this morning?"

I felt the hairs tingle at the base of my neck, and I knew that Mr. Spardleton was talking to Dr. Marchare. I heard, "Certainly, why don't I send Mr. Saddle out. He's worked with Callahan before—on that Pigeon Scarer Case, as I recall—and the two of them can decide what to do. That sound all right?"

I am afraid it sounded all right, because there was some chitchat and then the sound of the phone's banging into its cradle, and Mr. Spardleton's booming voice, "Oh, Mr. Saddle. Will you come in here a moment, please?"

I took a quick swallow of milk of magnesia, an excellent antacid, and went in. Mr. Spardleton was busy so he came right to the point. "They've got some kind of problem out at the Marchare Laboratory—don't know whether to file a patent application right now, or wait until the invention is more fully developed. Will you hop out there and get them straightened out? Callahan is the chemist, and you know him pretty well."

I certainly did. Callahan's name always reminded me of the time I took testimony in Sing Sing Prison on a Callahan application in Interference. But I nodded numbly and went back to my office and finished the bottle of milk of magnesia and caught a cab to the Marchare Laboratory.

It was cool in the lab and the air smelled faintly of solvents. I liked the smell, and I sniffed it deeply and tried to distinguish one from the other. My chemistry professor had often told me that I had the best nose he had run across in twenty-five years of teaching. I picked out the pungent, aromatic odor of toluene and the hospital smell of diethyl ether, and I thought I could detect the heavy odor of lauryl alcohol. Underneath them all was a rich, sweet smell that I had smelled before, but I couldn't tell what it was. I decided it was a lactone, and let it go at that. I nodded as I went past the receptionist, and her smile made me feel uncomfortable again, just as it always did; there was too much of a leer in it. I never stopped to tell her where I was going; I just went in unannounced.

I went up the stairs and down the hall to Callahan's lab, next to Dr. Marchare's. I went in. Henry Callahan stood at a bench pouring a colorless liquid down a chromotographic column. He looked over at me and said, "Well, Carl Saddle. How are you, man? Nice to see you."

Callahan was a big man, heavy-set, with bright blue eyes, and a shock of light-brown hair. For all his bulk he moved lightly as befitted a former stroke on the Penn crew. I was fond of Callahan, even with all the trouble his inventions caused me; I knew he couldn't help it. I said, "Hello Henry. How have you been?" And we exchanged some more amenities.

Finally he said, "Carl, we have quite a problem here, and we don't know what to do about it. Here's the situation."

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I swallowed, and took out my notebook and pencil, and laid my pocket slide rule in front of me. I always put the slide rule out where the inventor can see it to remind him that he is talking to another technical man, not just a lawyer. This helps make him stick to the facts. I didn't need the rule with Callahan, but habit is hard to break.

Callahan said, "Some time ago I made a polyester, used adipic acid and an amino alcohol. On a hunch I dropped in an aluminum alkyl, and then pushed the polymerization along with both ultraviolet and heat. Got a stiff gel out of the pot and drew it into a quarter of a pound of fibers. I only had time to determine that the fibers were amorphous—no time to draw them further to see if they would develop crystalinity. I put them in an open-mouth jar which I later found had been used to store mercury. One evening I took them out and found they had developed crystalinity on standing. Furthermore, the fibrous ends had split, and the split ends seemed to be tacky—seemed a natural to me to make a sheet of paper out of it."

I nodded as I worked furiously on my notes. All of Marchare's people talked that way. They did the most fantastic things sometimes, and then talked about them as if anyone would have done the same thing. I had complained about this oddity to Mr. Spardleton when I first came to work for him; I was used to inventions that were made in understandable ways. He had smiled and asked me to quote the last sentence of 35 U.S.C. 103, the statute that set forth the conditions for patentability. It was a good thing I had memorized the statute. I recited the last sentence, "Patentability shall not be negatived by the manner in which the invention is made." Well, here it was again.

I asked Callahan, "Did you make a sheet of paper out of it?"

"Sure did. Made a hand sheet in a twelve-by-twelve inch mold. Pressed it out, dried it, then got busy again so I couldn't test it for a week. When I did I started working nights to see if I could duplicate my results. Just finished this morning. Here's the hand sheet, the second one."

He handed me a sheet of paper, snow-white in color. I put aside my pencil and notebook to examine it. As I took it in my hand it was obvious that it was something unusual. It was softer than a cleansing tissue, and probably even more flexible. I rubbed it between my fingers, and it had the most remarkable feel of any paper I had ever felt—soft and clinging and cool, and exceedingly pleasant. I knew the paper chemists called this property "hand." Callahan's paper had the most remarkable hand I had ever seen.

"Tear it in half," Callahan said.

I took the sheet between my thumbs and forefingers and gingerly pulled, expecting the light and soft sheet to part easily. Nothing happened. I pulled harder, and still nothing. I smiled at Callahan, got a better grip,

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and gave it a yank. Then I twisted opposite corners around my fingers and frankly pulled at it. The absurd sheet refused to tear, and I realized how ridiculous I must look to Callahan to be unable to tear a flimsy sheet of paper. I suppose I lost my temper a little. I gathered as much of the paper as I could in each hand, bent over to put my hands on the inside of my knees, and pulled until I heard my back muscles crack. I let out my breath explosively and looked helplessly at Callahan.

He said, "Don't feel bad, Carl. Nobody has been able to tear it."

"You mean it?" I asked. I found myself puffing; I had not realized I was straining so hard.

"Yup. That paper has a tensile of 2,800 pounds per square inch, and a tear strength equally unbelievable."

I looked at the little sheet and great possibilities began to occur to me. "Clothing," I said. "Great heavens, think what this will do for the clothing industry. No more weaving. Just run this stuff off on a paper machine at five hundred feet per minute." I stopped and looked at Callahan and said, "You will be able to make it on a paper-making machine, won't you?"

"As far as I know."

"Good," I said. "When can we try it in the pilot plant."

"Well, that's where the problem comes in, Carl. I have to leave for the West Coast tomorrow, and I'll be gone for six months. There's nobody else around here to take it through the pilot plant. What's worse, one of my technicians left this morning to take a job with Lafe Rude Consultants, Inc., up in Boston. The technician is an ethical man, and all that, but I'm afraid the word will be out on this paper now."

My heart sank. Callahan said, "I've already started another of my technicians, John Bostick, on the process to make certain he can repeat my work. But that's all we can do for a few months around here. The laboratories have never been so busy. What do you think we ought to do?"

The answer was obvious. "We've got to file a patent application right away. It isn't ready to file, but we've got to do it anyway."

Callahan said, "Oh, we're in good shape. We *know* it works."

I nodded and said, "What acids other than adipic will work?"

"Oh, azelaic, sebacic, a few others, I suppose."

"What else other than amino alcohols? What other catalysts? Do you really need mercury vapor? Will some other metallic vapor do? What about temperature variations in making the polyester? How long a cure time? How much ultraviolet? Will the fibers be better if you draw them more? Can you get those tacky fiber ends in any other way? Can you improve them? What about the sheet-making conditions? Does oxygen in the air catalyze . . . ?"

Callahan held up his hands and said, "O.K., O.K., we don't know anything about it. But we're not going to find out these things until we open a research program, and we can't open

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a program for at least six months. In the meantime that technician may . . ."

I held up my hands this time, and he fell quiet. We stood silently until I asked, "All the information in your notebooks, Henry?"

He nodded, and I continued, "Well, I'll be back tomorrow to talk to you and Bostick. We'll just have to file a patent application on what we have."

We chatted a while about his work on the West Coast, and then we shook hands and I left. I had a few moments to think in the cab before I talked with Mr. Spardleton. Here I was in that situation that a patent attorney dreads. I had an incomplete invention, one that required a great deal of work before it could be filed, yet I had to file now in the incomplete condition. With it all, here was a most significant invention, one that would make the world take notice. This was one of the rare ones, I could feel it in my bones. It was obviously an industry-founder, a landmark invention on a par with the greatest, even in its incomplete condition. By golly, I was going to do a job on this one.

Mr. Spardleton was in a bad mood when I entered his office. I didn't have a chance to say a thing before he bellowed at me, "Mr. Saddle, do you know what a plasticizer is?"

"Why, ah, yes. It is a material, generally a solvent, that softens and renders another material more flexible."

"That's right." His fist banged on the desk. "Yet here," he waved an Office Action at me, "is an Examiner who says that the term 'plasticizer' is indefinite, and I must give a list of suitable plasticizers when he knows that Rule 118 forbids me to put in such a list. Can you imagine? He is saying in effect that a chemist who works with synthetic resins does not know what a plasticizer is, and I must take him by the hand and teach him something he learned in freshman chemistry. It has nothing to do with the invention, either. I am claiming a new kind of lens holder, and I point out that the interior of the holder may be coated if desired with a plasticized synthetic resin coating. My, I don't know what the Office is coming to. The Patent Office is the only institution in the world that does not know the meaning of the phrase 'room temperature'. Some day . . . What's the matter, Mr. Saddle?"

I had pulled up a chair and hunched down in it. Mr. Spardleton recognized the symptoms. He put down the offending Office Action and settled back and waited for me to tell him my troubles.

I said, "I've got a hot invention. It is a paper that will replace cloth, strong, flexible, cheap too. We've only made one version of it, though, and I have to file an application right away because one of Callahan's technicians left, and we can't risk waiting."

He nodded, and I went on, describing to him all the details of the invention and the situation. When I finished I stared morosely at the floor.

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Mr. Spardleton said, "What's the problem? File a quick application now, and later on when you have more information, abandon it and file a good, full-scale application."

I looked at him in surprise and said, "But somebody else has just as much information as we have, and he may start to experiment right away. That technician knows as much as we do. In another six months they could file a complete application and beat us out on dates; they'd be first with the complete application."

"Well, what do you propose to do about it?"

I shrugged. "I'll have to make up as good an application as I can right now. We'll make some guesses at how the research would go, and put it in."

"Oh now, look. You don't know"—he began ticking off the points on his fingers—"if you really need the trialkyl aluminum, or the mercury-treated glass surface, or the heat, or the radiation, or any combination of them. You don't have any idea of the conditions that are necessary to produce this paper."

"I know."

"All you've got is a single example that works. If you make your claims broader than that one example, the Examiner will reject you for lack of disclosure. This is basic in patent law. Ex parte Cameron, Rule 71, and 35 U. S. C 112 will do for a starter."

But I hadn't worked with Mr. Spardleton for nine years for nothing, and he had taught me how to play this game pretty well. I sat up straighter in my chair and said, "Yes, but in Ex parte Dicke and Moncrieff the disclosure of nitric acid as a shrinking agent for yarns was enough to support a claim for shrinking agents broadly; the claim did not have to be limited to nitric acid."

"Only because nitric acid was already known to be a shrinking agent for yarns."

I said, "Well, adipic acid is a known polyester ingredient."

"And all the other ingredients?"

I did then what he had carefully taught me to do when I was losing an argument: I quickly shifted to another point. "In Ex parte Tabb the applicant merely disclosed raisins and raisin oil, but that was enough to support claims to 'dried fruit' and 'edible oil'."

"But in that case the Board of Appeals said they allowed such terminology only because the equivalency of the substances could be foreseen by those skilled in the art, foreseen with certainty, too. Can you say that about your substances?"

I hesitated before I answered, and that was all he needed to take over. "A large number of ingredients was recited in In re Ellis, and since there was no evidence to show that they all would not work, the applicant was allowed broad claims. But you'd have trouble making your guessed at ingredients stick. In the case of Corona Cord Tire Company v. Dovan, the court said the patentee was entitled to his broader claims because he proved he had tested a reasonable number of the members of a chemical class. Have you?"

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I started to answer, but Mr. Spardleton was in full swing now, and he said to me, "No, sir, you haven't. You are not ready to put in broad claims on a half-baked invention."

It was the "half-baked" that did it. Controlling my temper I rose to my feet and said in a purposeful, quiet voice, "I think I see clearly how this case should be handled in this situation. I shall prepare it in that manner, and file it, and prosecute it, and obtain a strong patent on a pathfinder invention. I'll keep you posted." I turned and walked out. Just as I passed through the door I thought I heard him say softly, "Attaboy, Carl," but I must have been mistaken. Mr. Spardleton never calls me Carl.

I got right at it the very next morning. I opened the office myself and began studying my notes to see how broad a claim I could write for the Tearproof Paper Case. I listed all the ingredients in one column, and then filled up the adjacent columns with all the possible substitutes I could think of. I didn't even know it when Susan arrived at the office, stood in my doorway for a moment, and then tip-toed away. Later on Mr. Spardleton looked in on me, and I wasn't aware of that, either. It was ten o'clock before I finally came up for air, and then I dashed out to the Marchare Laboratory for another talk with Callahan. I explained how I was going to handle the case to make sure we got a good, broad patent application into the Patent Office.

"Can you do that?" he asked.

"Oh, yes. We can put in all the things we think will work, but if we are wrong we are in some degree of trouble. But I feel that with both of us working on this we ought to be able to turn out a good sound job. I'll keep sending you drafts out in San Francisco until we finally get one we think good enough to file. But we can't waste time. This is a hot one, and we want to get it in as soon as possible."

He shrugged his shoulders, and we sat down to work on my lists. Neither one of us realized it when lunch time came and went. But that's the way it is with world-beater inventions; they sweep you along. Early that afternoon I dictated my first draft to Susan. Callahan and I went over the draft, and then he left for San Francisco. The next time around we had to use air mail. With each new draft we added more to the basic information we had, rounding out the invention in ever greater detail. I added example after example, being careful to state them in the present tense; I did not want to give the impression that the examples had actually been run.

In a month's time I checked with John Bostick. Bostick had been able to duplicate Callahan's work, and we had three more, flimsy, diaphanous sheets that could not be torn by human hands. That was all I needed. Now I knew that anyone could duplicate the Tearproof Paper, and I had at least one, good, substantial working example for my patent application. The knowledge gave me greater confidence in the alternate

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materials and procedures that Callahan and I had dreamed up. I prepared a final draft containing twenty-three pages of detailed specification and eleven examples and topped it all off with forty-six claims. It was a magnificent application, considering what I had to start with. I handed it to Mr. Spardleton and sat down to hear what he had to say about it.

I watched him out of the corner of my eye as he read it, and I had the pleasure of seeing his cigar slowly swing outward until the glowing end was almost beneath one of his ears. This, I knew, was his Amazed Position, and it was rare indeed that I or anyone else ever saw it. Mr. Spardleton was a man who does not amaze easily.

He finished and looked up at me and said, "I assume this is the same invention you told me about last month?" When I nodded he continued, "And I further assume that you have no experimental data in addition to that you described last month?" Again I nodded, and he said, "All of this is paperwork with the exception of Example I?" I nodded again, and he put the draft down in front of him and stared at it.

I began to grow uncomfortable in the silence. Then he said, so softly that I could hardly hear him, "I remember, many, many years ago, answering the phone, Cliff Norbright—great chemist—telling me he had smelled phenol when he heated ethylene chlorohydrin in the presence of holmium-treated silica gel in a test tube. I wrote the greatest patent application of the age based on that evidence. Just like this one." He laid a hand on it, and shook his head, and smiled.

"There is no crude guesswork on this product," I said. "The work has been duplicated, and I've seen many specimens of this paper. I tell you, sir, there never has been anything like it. Why, even Callahan . . ."

"Yes, tell me about Dr. Callahan. He is usually a pretty conservative fellow. How does he feel about this completely untried product?"

I sat up straighter. "This is not an untried product, Mr. Spardleton. It has been made and duplicated. It has all the properties that the application says it has. And Dr. Callahan has just as much faith in it as I have."

Mr. Spardleton looked at me, and smiled, and slowly handed over the draft. "Mr. Saddle, I wish you all the best in your prosecution of this case. Please call on me if there is anything I can do to help. In any way, don't hesitate to call on me."

I stood up and took the draft and turned to go, but Mr. Spardleton thrust his hand out. I shook it and said, "Is anything wrong with it?"

"Not that I am able to see, Mr. Saddle. It is a most remarkable job, and bespeaks of ingenuity, resourcefulness, and skill. You have come a long way to be able to write such an application."

I didn't know what to say, so I smiled and bobbed my head and walked out still looking at him and smiling, which made it necessary for me to walk sideways, and thus made

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me look, I suppose, somewhat like a crab.

Susan put the case in final form. We sent the papers to California for Callahan's signature, then we filed the case, and things got back to normal with me. It was a great relief not to have the strain on me night and day. That's the trouble with an important case. You live with it too much.

It was seven months before I got the first Office Action in the Case. I read the first few paragraphs and they were quite normal. They rejected the Case in the usual manner by citing prior patents that had nothing to do with my application. This kind of thing was just part of the game of prosecution in which the Patent Examiner makes rejections because that is what he is supposed to do no matter what the invention; they don't have to make much sense. But then came a paragraph that went way beyond good sense and proper rejection technique. It said:

The specification is objected to as containing large portions that are merely laudatory. See Ex parte Grieg, 181 OG 266, and Ex parte Wellington 113 OG 2218. These portions are superfluous and should be deleted, Ex parte Ball, 1902 CD 326. The specification is unnecessarily prolix throughout and contains an unduly large number of embodiments, Ex parte Blakemen, 98 OG 791. Shortening is required.

I didn't wait. I grabbed the file of the Case and almost ran over to the Patent Office to straighten out the Examiner on a few things. As usual, Herbert Krome was the Examiner, so I charged up to his desk and immediately began explaining to him the importance of the Tearproof Paper Case. He seemed to pay no attention to me, but I knew him; he was listening. When I finally paused to let him say something, he looked at me quizzically and said, "Mr. Saddle, aren't you aware of the Notice of October 11, 1955?"

I looked at him blankly and said, "What's that?"

"It says that interviews with Examiners are not to be held on Fridays except in exceptional circumstances."

I gulped and said, "Is today Friday?"

He pushed his desk calendar toward me. It was Friday all right, and the thirteenth at that. I was too embarrassed to speak, and I got up and began to walk out. Mr. Krome called after me. "This must be an important case, Mr. Saddle. I'll expect to see you the first thing Monday." I nodded, and left.

By Monday, my embarrassment had not diminished. I had really done an unheard-of thing in patent prosecution. In patent prosecution, the patent attorney has six months to respond to an Office Action. Since attorneys carry a docket of cases adapted to fill all their time, an attorney in most instances requires the full six months to respond to an outstanding Office Action. Industrious attorneys with relatively light dockets might

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respond in five months' time. This may also happen when the attorney is trying to get a little ahead so he can go on a vacation. There are rare instances of record when an attorney had taken some action in three or four months. But here, in the Tearproof Paper Case, I had actually gone for an interview on the very first day. I couldn't possibly go back on the following Monday; my pride would not allow me. I waited until Tuesday.

By that time I had gone over the entire rejection and planned my complete response to the Examiner. I sat down with Mr. Krome on Tuesday morning and talked steadily for fifteen minutes before I realized he was watching me instead of paying attention to the case. I said, "What's the matter."

He said wonderingly, "I've never seen you like this before. You are acting almost as unreasonably as an inventor. You don't even want to hear what I have to say about this case. You should relax, Mr. Saddle. You are here as an advocate, not as a midwife."

"I don't think that's very funny, Mr. Krome," I proceeded to explain the high merit of the case, and he seemed to listen then. Before I left he promised to give the case careful consideration. This was all he ever promised, so I thanked him and went back to my office. I filed my amendment in the case the next day. It was eight months before I got the next Office Action.

Callahan returned in six months and immediately opened a project on the Tearproof Paper. The two of us sat down together to determine the best way to handle the research.

I said, "Henry, we have already drawn up a complete research program. All we have to do is follow it."

"We have?" Callahan was surprised

"Sure." And I laid out in front of him a copy of our patent application, and riffled through its pages. "All we have to do is go through all the examples here to make certain they all work. If they do, the program will be complete, except for the product itself and commercial production. Our patent application will make the best research guide we could get."

"Why certainly," said Callahan. "We have already spent a great deal of time working out all kinds of substitute and equivalent reactions. It's all here. Good. I'll set it up."

Callahan began distributing the work to various groups, and I went back to my office. Every Friday afternoon thereafter I went out to the laboratories to see how things were coming along. They came along well. From the beginning the actual results reached by the research teams matched the predictions we had made in our patent application. At the Friday afternoon meetings Callahan and I got into the habit of tossing pleased and knowing glances at each other as the streams of data continued to confirm our work. Several months rolled happily by. Then came a letter from the Lafe Rude Consultants, Inc., up in Boston. The letter said that their people understood that the Marchare Lab-

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oratories had under development a remarkably strong paper, and they would be very much interested in discussing licensing possibilities wth us. I grabbed the letter and stormed into Mr. Spardleton's office.

"Just read this," I almost yelled as I handed him the letter. "This is the outfit that hired Callahan's technician. Now they know all about the Tearproof Paper. That technician has told them everything. I think we ought to sue them—inducing disclosure of trade secrets, or something." I added a great deal more as Mr. Spardleton finished the letter and sat holding it looking up at me as I paced back and forth in front of his desk. As I walked and talked, I finally became conscious of the fact that Mr. Spardleton was waiting for me to finish; I could tell by the expression on his face. I pulled up in front of him and fell quiet.

He said, "Don't you feel it is significant that this letter was sent to us, lawyers for Marchare Laboratories, rather than direct to the Laboratories?"

I thought about it, and he continued, "Furthermore, as I understand it, the Lafe Rude people have a good reputation."

That was right, too, and I saw what he was driving at. People of good reputation don't try to pull a fast one by immediately alerting the lawyers for the other side. In fact, when I stopped to think about it, I could see that they were bending over backwards to be careful in this situation.

Mr. Spardleton said, as he handed back the letter, "I suggest you clear with Dr. Marchare, and then make arrangements to talk to these people and see if you can negotiate some kind of profitable license. Marchare is pretty fully committed right now, and I don't think he has time to exploit this paper, even if it turns out to amount to something."

I looked at him, aghast that he should still be doubtful of the paper at this late stage of the game. He saw my look and said, "Oops, I mean this milestone in paper technology once it is announced to the world."

That seemed better, more to the point. I called Dr. Marchare and found that Mr. Spardleton was right, as usual. Dr. Marchare would welcome a beneficial licensing arrangement. I then called the Rude Associates on the phone; it seemed more expeditious than writing. I set up a meeting date as soon as possible, one week away.

The day before I left for Boston I checked in with Callahan to make certain all of our data were correct. We went over every aspect of the Tearproof Paper Case. I picked out a dozen good samples of the paper of varying composition and thickness and put them in my briefcase along with a copy of the patent application. I had decided that I might even show them a copy of the application if it might help show what a marvelous discovery we had made. Callahan and I shook hands solemnly, and he wished me the best of luck. I went back to my office for a final quick check, got

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interested in Zabell's book, and went home without my briefcase. There was no harm done. My plane did not leave until ten in the morning and I had planned to go back to the office anyway. I said good-by to Susan and Mr. Spardleton, retrieved my briefcase from over by the radiator where Susan had put it the night before, and caught the plane.

It was a cold damp day, and the threat of rain was in the air. In Boston I caught a cab for the Massachusetts Avenue laboratories of Rude Associates. Dr. Rude himself was at the meeting, along with half a dozen of his associates. Dr. Rude was a small man, dapper, totally unlike a research chemist, and his speech and manner were as impeccable as his dress. Only his hands were a giveaway; they were stained with yellow and black stains that looked completely out of place on the man. Dr. Rude opened the meeting with an explanation concerning the technician he had hired from the Marchare Laboratories two years earlier. "Just a week ago," said Dr. Rude, "we put him on a problem of paper chemistry. He told us that the properties we sought—and more—had already been found by your laboratory. He said no more, and we would not have allowed him to say any more, except that you were the patent lawyer who was working on the case. That is all we know about it. We hope you have something of mutual interest, but we don't know any more than what I have told you."

I said, "Thank you, Dr. Rude. I understand how it was. I assure you it never crossed our minds down in Washington that anything could have been out of line in any manner whatsoever."

The assembled group smiled, and I smiled back, and we all felt friendly with one another. Dr. Rude cleared his throat and said, "Well, is there anything you can tell us about this tearpr . . . about a paper having some of these very interesting properties?"

I said, "There is a great deal I can tell you about the paper we have, but suppose I let you see some specimens before I say anything. There's nothing like the actual goods themselves to do most of the talking."

We all laughed as I took half a dozen twelve-by-twelve hand sheets out of my briefcase and passed them around the table. I watched the chemists finger the sheets, savoring their soft coolness, and I heard the whispered comments, "good hand," "excellent softness," "fine color," and a few others. Dr. Rude said, "Are these 'breaking samples', Mr. Saddle? Do you mind if we tear them?"

Well, you can see that this was the question I was waiting for. I sat back and allowed a slight smile to play over my face. I said, "Oh no, gentlemen. Go ahead and tear them."

I saw several of the people take the sheets between their thumbs and forefingers, and gently pull. I saw the sheets tighten momentarily, and then —as if the sheets were no more than ordinary cleansing tissue—I saw the fibers pull apart as each man easily tore the sheet in half.

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I felt the blood drain from my face, and it seemed to me that my pounding heart must have been visible right through my clothes. I swallowed and tried to say something, although I had no clear idea of what I was going to say. Words would not come. I leaned over and took another sheet from my briefcase and tugged at it. It tore in half with practically no effort. I took another, same results, and still another. I dimly realized that all the people at the meeting were staring at me, but I wasn't concerned. I knew something must be wrong with all the specimens; possibly I had placed regular cleaning tissues in my briefcase, or maybe Susan . . . but even as I thought it I knew such a mistake was impossible.

I reached over and tried tearing one of the sheets I had passed out to the others. It tore into quarters as easily as it had torn into halves. That finished me. I leaned back and looked around at the silent group and wondered what Mr. Spardleton would have said at a time like that. I started to smile and discovered that my original smile was still frozen on my face. I stood up and began retrieving the torn papers; they passed them back to me without saying anything. I replaced them in my briefcase, closed it, said, "Gentlemen, Christmas falls on Friday this year," and walked out.

It was raining outside, but I scarcely noticed. I hailed a cab to the Logan Airport, changed my reservations to an earlier plane, and returned to Washington. It was a slow trip. The planes were stacked up in the rain at the Washington International Airport, but I did not notice the passage of time. I was too stunned to think clearly, but I kept trying. I got quite wet in Washington, but I was in a hurry to see Mr. Spardleton and I did not bother to change my clothes.

I burst into his office. He looked up and said, "Well, I didn't expect to see you until tomorrow. How did . . . ?" He saw my face.

I plopped my briefcase on his desk and pulled out all the specimens and dumped them in front of him. I said, "Just look at these. This 'Tearproof Paper' has deteriorated. These specimens are useless. Right in front of all the Rude chemists, they go bad. Most of them are new ones, too. How can this be possible? Just look at them."

Mr. Spardleton picked up one of the sheets, rubbed it, and then tugged at it gently to tear it. It did not tear. He pulled harder, and then harder, and it did not tear. I stared at him in disbelief and said, "Oh, Mr. Spardleton, this is no time to play games with me."

I took one of the sheets and yanked it, and almost cut my fingers. I bent over and put my hands on my knees to get better leverage just as I had the very first time, but the sheet would not tear. I threw it on the desk and tried another with the same results. One after another I ran through them all while Mr. Spardleton sat back and watched me. I was wild-eyed when I finished.

Mr. Spardleton said, "Mr. Saddle,

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would you mind telling me what has happened?"

I pulled up a chair, groped for my voice, and finally got the story out. He looked at me strangely, tried to tear another of those miserable little sheets, and said, "Mr. Saddle, do you feel all right?"

In Boston I had been completely deflated and bewildered, but now I was mad. I grabbed up the phone and called Callahan. I had barely started to pour out the story when he said, "I'm glad you called, Carl. We seem to have run into something on this paper thing. Looks bad. Can you come out?"

"Be right there." I hung up.

Mr. Spardleton went out with me; he didn't want me to go anywhere alone. Callahan was holding two sheets up to the light when we went into his lab. He said, "Two identical sheets, except for the moisture content. Moisture is the devil. One of these is dry; the other contains three per cent moisture. Here's the dry one." He tore it in half effortlessly. "Here's the moist one'.' And he strained at it, but it would not tear. "We just ran across this effect last night, and finished checking it out an hour ago. Have you been to Rude Associates yet?"

I nodded.

"Too bad. We'll have to show them what can happen."

Mr. Spardleton said, "They already know."

Callahan said, "This kicks the whole thing in the head. The paper can never be more than a laboratory curiosity, as far as we can see. The sun, a dry climate, heat, any of these things will drive off the moisture, and the paper will lose its strength. There's no way we can market a product like that when it might lose its strength at any time. I'm afraid the 'Tearproof Paper' must join the huge list of fine products that can't be sold because of one small flaw."

It was Mr. Spardleton who steered me out of the labs. He slipped an arm through mine and said, "You can refile the patent application and add this information about the moisture content. You ought to get the patent without too much trouble even if the product is of no commercial value."

I nodded as we stood in the rain waiting for a cab.

He said, "I never told you what happened in that Phenol Case of mine many years ago. It turned out that the man at the next bench had spilled a little phenol on the bench top. That's what my inventor smelled; there never was any phenol in the test tube. We all fall over the facts of a case now and then." He squeezed my arm, and the rain did not seem to fall quite as hard. ■

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Sorcerer's Apprentice

Some people just can't seem to get their teeth into the idea of working for a living. So maybe a special kind of dentistry could help . . . ?

by Christopher Anvil

Illustrated by Brey

■ To say that Ambassador Smernov was in a bad frame of mind would have been an understatement. It was obvious to Vassily Kuznetzov, Smernov's assistant, that the ambassador was as hot inside as he was outside, and in this Caribbean climate that was no small achievement. Kuznetzov eyed the ambassador with the practiced gaze of a farmer living on the slope of a volcano. From the preliminary rumblings, tremors, and the general impression of pressure building to the danger point, Kuznetzov could not escape the impression that the ambassador was about to erupt.

Two tanned and grinning boys ran past the construction project carrying a banner. Smernov gripped Kuznetzov by the arm.

"Look at that!"

Kuznetzov unhappily stared at the sign:

YANKEE SI! CUBA NO!

The breeze shifted momentarily so that instead of the rush of the surf and the *putt*-cough of a small fishing boat bobbing off-shore with engine trouble, there came to them the roar of the bulldozers clearing jungle back in the hills, and the pound of hammers and whine of saws in the housing project.

The ambassador glared at the buildings going up, stared at the backs of the two boys and their banner, looked down angrily at the new wharf running out into the harbor, looked back at the steadily-laboring workers and the rising buildings, and spat out a four-foot length of profanity.

Kuznetzov winced and took on the look of a man outdoors in a strong wind.

The Caribbean sun beat down on them, it's glare almost a physical attack.

Smernov gripped Kuznetzov by the arm. "You see that wharf out there?"

Obviously Kuznetzov saw it. "Yes, Mr. Ambassador, he said.

"You see those buildings going up?"

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"Yes. Yes, Mr. Ambassador."

"All right. Good. You have eyes in your head. Now, did you see that road we drove in on this morning?"

"Yes, Mr. Ambassador."

"Six months ago," said Smernov furiously, "that road wasn't there. And this wharf is new. And that housing project you're so complacent about—*that's* new. And you know who's putting them up?"

"Why, the Americans, Mr. Ambassador."

Smernov glared at him. "*Who?*"

Kuznetzov stammered, "Why, surely, the Americans. I mean, the capitalist-imperialists. The monopolis—"

Smernov lit up like a volcanic glare. He let his breath out in a hiss, and stared off at the green hills in the restful interior. The changing patterns of fluffy clouds that cast dark moving shadows across the hills provided some distraction, until one of the shadows in moving on let the sun shine on the new dam rising in the interior.

Smernov grunted, and looked back at Kuznetzov. "You've missed the whole point," he said. "Take another look at those workers."

Kuznetzov polished his glasses, wiped the sweat off his forehead, and studied the scene. The rhythm of the workers was unmistakable. No one raised in this tropical heat and humidity would work like that. Then Kuznetzov scowled and looked again, studying the features of the workers, the faces and arms swarthier than he thought a few months of sun could make them. And yet—there was still, he told himself, something unmistakably Yankee about the way they moved. And they were dressed like Americans. They seemed to be working in six-hour shifts on the job, and as they changed shifts now, in midday, the men coming on were wearing palm-tree shirts, and carrying cameras to the big shacks where they changed to their working clothes.

Kuznetzov squinted.

Satisfied that he was right, Kuznetzov studied the expressions of the workers, the way they moved, their manner of greeting each other, their look of pride in themselves and their work.

Smernov said, "Well?"

Kuznetzov shrugged. "They are Americans."

"And you are a donkey," said the ambassador. "In the first place, if you open your ears, you can tell that they are talking Spanish. In the second place, they are too eager about their work. In the third place, they aren't using enough machinery. And in the fourth place, it is only American *tourists* that go around carrying cameras. There are more cameras going back and forth to work here than on any one hundred American building sites. What do they want to take cameras to their *work* for? It is only people who have newly acquired such possessions who carry them around for the pleasure of ownership and for prestige."

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Kuznetzov stared at the men going off shift.

"I didn't think of that."

"Well," said the ambassador, "we are going to get to the bottom of it. These people were born here. They shouldn't be working like that. They should be growling about the *latifundia* and trying to think up some way to get a government pension. Every other way to earn an honest living should have been closed up to them. Meanwhile, the Americans should be pumping in money, which the local dictator will stuff in Swiss bank accounts, and use to pay his guards to keep the people from killing him for not correcting all the trouble nature and three hundred years of bad management have piled onto their heads. And the American Banana Company should be hand-in-hand with the local dictator, because if they aren't he will wreck their business in self-defense, and meanwhile they make a good scapegoat for him, since he can privately blame all the troubles in the country on them." The ambassador beamed. "What do you think of that?"

Kuznetzov wasn't sure what he thought of it, so he said politely, "Yes, Mr. Ambassador."

The ambassador squinted at all the activity going on despite the heat, and growled, "The problems in a country like this are so complicated, Kuznetzov, that the Americans *cannot* solve them. As I have just explained to you. In fact, it is so complicated that there is no way out except to smash the whole thing and start all over from the ground up. But the Americans won't do that. So, there is no one left to clean up the mess except us. Do you understand?"

"Yes, Mr. Ambassador."

"The trouble with the Americans is that they believe in peaceful evolution. But what this place needs is violent revolution. So—" The ambassador sucked in his breath sharply, and stood like a man paralyzed, watching something take place near the construction project.

Kuznetzov was vaguely aware that a big expensive car had been parked in front of a rough building with a small American flag on it. The car had pulled forward to a wider place in the road, near the construction work, and backed around with a multitude of flashes from the slanted windows and polished trim. It had then started to drive away. It had, however, backed up again, and Kuznetzov vaguely supposed the driver wanted to ask something of the workers in the project. He saw now, however, that a young man had gotten out of the back of the car, wearing black trousers and coat, and was talking with a group of the workers, who crowded around looking friendly and excited.

Abruptly the man talking to the workers took off his black coat and tossed it in on the rear seat of the

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car. He took off his string tie, folded up the arms of his elegant shirt to the elbows, tossed the tie into the back of the car, and took a hammer one of the workmen handed him.

Immediately, both front doors of the car opened up. A man in chauffeur's uniform popped out one side, and a bodyguard with slab face, huge physique, and a drawn gun, surged out the other side. The shirt-sleeved young man with the hammer waved them away. They expostulated with him. Finally, they tried to take him by the arms and drag him back to the car. The workers immediately cracked the guard and chauffeur over the heads and knocked them senseless.

In the abrupt silence, two Spanish sentences carried to the ambassador and Kuznetzov:

"It is bad teeth that make such bad temper. Take them to the Yankee aid station."

Several workmen picked up the chauffeur and the bodyguard and carried them into the rough building where the car had been parked.

Smernov and Kuznetzov looked at each other blankly.

The renewed sound of hammering came from across the way.

Smernov took a hard look at the flag on the building, then back at the young landowner and the friendly workers.

Kuznetzov was now beginning to get the picture. "Something is certainly very much out of the ordinary here."

"Something underhanded is going on." The ambassador looked as if he had been punched in the stomach. "There is some trick here." He looked back at the rough building where the workers were just coming out after carrying in the chauffeur and guard. He looked hard at the small flag. "And right there," he said, "is where we will find out what it is. Come on."

Kuznetzov followed him across a stretch of cleared ground to the building, then up the steps and in the door, which sounded a gong as it opened.

Inside was a long counter to the right, with shelves laden with thick pamphlets behind it. Above the counter was a sign:

Information. Reliable. Inexpensive.

Directly ahead was a flight of steps, with a sign reading "Trading Post."

To the left were two barber chairs, three dentist chairs, and a closed door marked, "Doctor." The two barbers were playing checkers, and a pair of dentists were laboring at the opened mouths of the guard and the chauffeur.

A man appeared behind the counter to the right. "May I help you, gentlemen? How about a copy of the Do-It-Yourself Master Guide? Or a Concrete Handbook? Our works are very complete."

Smernov said, "What we'd like is something on ideology."

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The clerk looked blank. " 'Ideology'? Let's see—Does that have to do with bathrooms?"

Smernov cleared his throat. "I mean, dialectics."

"Oh, dielectrics. Hm-m-m. I think we have something here." He looked vaguely at the shelves, pulled out two or three titles at random, then opened a door into a back room. "Oh, Jim—"

A second man appeared. The clerk turned back to the ambassador. "This is the manager. He'll take care of you."

The manager smiled. "You'd like something on dielectrics? Did I hear that correctly?"

"Dialectics. What we are looking for is something on ideology."

"Oh, I see. We don't have much call for that." The manager seated himself at a desk, pulled out a file of some kind, flipped through it rapidly, and said, "How about some of these: 'How to Decommunize Your Country,' 'Beating the Reds to the Punch,' 'How to Foul Up Street Demonstrations,' 'Six Dozen Stunts that Jolt the Pinkoes.' " The manager looked up. "Am I on the right track?"

Smernov stared at him, then abruptly came to life. "Yes. That's what I'm looking for. We'll take all of those."

Kuznetzov said in a low voice, "Do we want to have *those* things in our luggage?"

Smernov murmured, "Don't be silly. This isn't the bad old days. Besides, after we read them, we'll chop them up into little pieces, burn them, grind up the ashes, and flush them down the sewer a little at a time."

The manager got out a list about half as long as a man's arm, and came over with it. "Just check the books here you want, write your name and address on top, and we'll send in for them. We haven't had much demand for that selection lately, so we'll have to make a special order."

Kuznetzov and the ambassador looked at the list. There appeared to be about a hundred titles, culminating with a work on "How to De-Communize a Communist."

The manager said, "It will only take about four days to get them. Take the order sheet along if you'd like, and look it over."

The ambassador cleared his throat. "Yes. Thank you."

"Anything else we can do for you?"

"No. No, this is fine."

The manager smiled pleasantly, and moved off into the back room.

Smernov folded up the order sheet, looked at the sign, "Trading Post," glanced at Kuznetzov, and led the way up the steps.

The "Trading Post" proved to be a small store jammed to the rafters with hammers, axes, machetes, kegs of nails, cameras, portable radios, carpenter's saws, bow saws, power saws, sun glasses, California-type shirt, big straw hats, shovels, hoes, women's

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dresses, and a huge stack of mail-order catalogues.

Finding nothing that answered their question there, they went downstairs, looked around again, and walked outside. The ambassador got out the order list, and squinting against the glare, looked it over.

"I just don't believe," he said frowning, "that their propaganda could have been *that* effective. This has all been too subtle. There is still something—"

The door opened up, and the chauffeur and the guard staggered out and headed for the car. They were almost there when they stopped and looked at the construction project They paused and looked at each other. They started for the car, and the chauffeur even got the door open. But then the guard drifted off, stopped one of the workers, and began pleading for the use of his wheelbarrow. The guard ended up proudly shoveling dirt into the wheelbarrow.

The chauffeur, like an iron bolt under the influence of an electromagnet, now began to drift from the car to the construction project. About halfway there, he paused, looked at the car, snapped his fingers, went back to the car, jacked up the front end, went into the building he'd just come out of, reappeared carrying a grease gun, and crawled under the car.

Kuznetzov mopped his forehead. Smernov scratched his head

With a *bang*, the motor of the fishing boat out in the harbor started, and they watched it chug out into the ocean. Everywhere they turned, people were busy.

Smernov murmured, "First the dentist operates on them, then they come out here and go to work. It seems insane, but—" He looked at Kuznetzov, cleared his throat, and spoke in the syrupy tones of one who is overly considerate of another's welfare. "Vassily Kuznetzov, my friend, didn't you say your wisdom tooth was hurting you the other night?"

Gloomily, Kuznetzov trudged across the road to enact his role as guinea pig

He went up the steps, opened the door, went in, and encountered the gaze of the clerk behind the counter, the checker-playing barber who happened to be faced in his direction, the two dentists rinsing down little bowls affixed beside their chairs, and two other men, apparently the other dentist and the doctor, who were standing outside the door of the doctor's office, and stopped talking as Kuznetzov came in.

The tail end of their conversation registered on Kuznetzov as he shut the door:

". . . Tone that thing down the next batch they send or there's going to be some heat exhaustion around here."

Kuznetzov looked at one of the dentists, and cleared his throat.

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The dentist standing with the doctor immediately said, "Trouble with your teeth, sir?"

"A wisdom tooth that gives me an occasional pain."

"Swollen at all?"

"Oh, no."

"Well, if you'll just come over here and sit down, I'll take a look at it."

Kuznetzov settled into the dentist's chair, feeling all the customery sensations that go with this procedure. The dentist bent Kuznetzov's head back onto a head rest, shone a light in his mouth, and groped at his wisdom tooth with a long steel explorer which caught in a hole, and gave a gritting sound. The dentist straightened up and reached for something out of Kuznetzov's range of vision.

Vassily Kuznetzov wished earnestly to get out of this place.

Something swabbed his gum, and the next moment there was the pressure of a hypodermic needle. The dentist removed the needle. "Been here long?"

Kuznetzov was perspiring freely. "A few weeks."

The dentist laid out an assortment of drills, selected one, and held it up to examine it closely, "Nice country, don't you think?"

Kuznetzov eyed the drill. "Yes. But the people surprise me."

"How so?"

"They're so . . . busy."

"They're hard workers. You didn't expect them to be?"

"Well—"

"How's the gum? Numb yet?"

"Just a little."

"It'll be ready in a minute or so. We have efficient drugs these days. What science can do, given time and a good idea, is really wonderful."

He had the drill tightened in its chuck now, and checked to be sure his instruments were all at hand. He tapped one of these tools against Kuznetzov's gum, and Kuznetzov reported unhappily that he felt nothing. The dentist leaned forward and reached into Kuznetzov's mouth.

There promptly followed a whine, a grinding vibration, a squirt of water, and Kuznetzov was spitting out little bits of tooth and old filling. The dentist began a good-natured, one-sided conversation.

"Now, lean back, and just relax . . . This may buzz a little, but it won't hurt . . . Yes, our drugs are certainly efficient. Science and a good idea, given time, can do some wonderful things . . . A little wider, please. Tell me if this hurts . . . What we need most, in science or just about anything else, is a good, sound, workable idea. We've got a lot of people working on techniques now, but we need people to work on ideas, too. Why, it's ideas that make a people great. Not ideas alone, of course. It takes work. 'One per cent inspiration, and ninety-nine per cent perspiration,' as Edison said . . . Open a little wider . . . But without the one per cent inspiration, you can

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perspire from now till doomsday, and just get a backache out of it . . . Hurt? . . . You see, the right idea makes all the difference. But it has to be put into effect through practical measures. Why, it wasn't so long ago that the world was loaded down with knights, dukes, barons, and so on, not chosen by worth but because some ancestor twenty generations back was worth something. Gunpowder and the rise of manufacture helped unload that setup. Next came the same general kind of thing, only with huge inherited wealth instead of inherited rank as the gimmick. Universal suffrage was the little device that damped that one down. But next came . . . Better spit that out, and rinse out your mouth."

Vassily felt of the tooth with his tongue, and found a hole larger than he had realized the whole tooth to be. Extremely uneasy, he sat back again.

"Yes," said the dentist cheerfully, "we have one trouble following another, but the big trouble that caused most of our other troubles, with noblemen, bored playboys, selfish-type pressure groups, and so on, is that these people want *something for nothing.* They want to take out of the general fund without putting in. That's wrong. Wherever a nation has been great in some line of activity, there have been a large number of people confident that if they added enough to the general fund, they would be rewarded, either in wealth, fame, the advancement of their cause, or whatever else they were interested in. When people think they can get something for nothing, or when they think they will get nothing back for their something—that they will be suckers, in other words—the system breaks down. And when you've got a state set up so the people on top want something for nothing, and the people on the bottom expect nothing for something, or vice versa, then, my friend, you have a mess, and no aid program, no technical advice, no exhortation to new efforts, is going to work until there is a big enough group of people confident that if they do their best for the cause, they will get fair treatment. The problem is—how to get these people? . . . Spit that out please, and we'll fill it, and you'll be all set."

Kuznetzov leaned back again, and the dentist began to put some form of material into the filling. This part was different from what Kuznetzov had experienced before, and seemed to require extra care and concentration.

"Hm-m-m," said the dentist finally. "There, now keep your mouth wide open . . . Yes, the problem is, how to get this group of people—we might call them reciprocators—who trust each other to work along a variety of lines for the general good, and who are prepared to give an honest day's

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work for an honest day's pay. Who, in fact, are uncomfortable if they don't give an honest day's work for an honest day's pay. And who know they're uncomfortable if they don't work. The more of these people you have, the stronger your position is. You see, when you have enough of these people in the right positions, the country starts progressing of itself, and no radical movement can get anywhere, because it serves no useful function." The dentist put a mirror on a stick in Kuznetzov's mouth. "There, I guess we're ready to finish."

Vassily Kuznetzov was conscious of something strange, but unable to say exactly what it might be.

The dentist reached for a new tool, and began packing the cavity, "Yes," he said, "science and a good idea are a wonderful combination. Usually the idea is *within* science, for the development of science or technology. But then, too, science and technology can be used to convey ideas—the radio, and television, for instance. But how often do they spread the ideas of mutual trust and the willingness —eagerness—to do a good day's work and give a fair return? Not often. But, of course, new discoveries are continually being made. And we know, from practical experience, that somehow, thoughts often seem to be contagious. It might be possible some day, to duplicate the impulse thrown off by a brain thinking certain admirable thoughts. It would be a kind of radio set, designed to affect, not the external ear, but whatever it is in a man that picks up mood, atmosphere, and reacts to that communicable zest and eagerness when conditions are just right for progress. Such a device could probably be quite small. We've seen what transistors have done for radio sets. We can even guess that the device would probably need to be located, or have a part of itself located, very close to the man to be affected by it. Possibly it would even be located inside his own head . . . There, now. Bite on this piece of paper. Gently. How does that feel. All right? Fine. Let's see now. Yes . . . Yes . . . O.K., pay the cashier at the counter on the way out. Our fees are very reasonable. If you have any trouble with that, let me know. It should be all right."

Kuznetzov dazedly paid, and went out, passing on the way a man who looked like some kind of bandit and was being carried in tied up with rope.

Kuznetzov stopped on the road outside the building, and looked around. The world appeared somehow to be different to him. He took a breath of air. He was conscious of its freshness, despite the heat. He became aware of the possibilities of life. Look, he found himself thinking, at all the things he could do, and the only thing that was required of him, of *any* man, was to give a fair return.

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A pretty girl walked by, and Vassily smiled at her. She smiled back, and Vassily beamed.

A pale, rather unhealthy-looking man crossed the road.

"Well, Kuznetzov?" he demanded.

"Oh," said Vassily, recognizing him. "Hello, there, Smernov."

The ambassador looked jarred.

Kuznetzov looked around. His muscles felt the need of work, his brain cells the need of the stimulation of a problem. He was a man, wasn't he? He must earn his keep. Now then, what to do? He would have to find some regular line of business that would keep him supplied with reliable opportunities for work.

The ambassador was scowling at him. This expression had once seemed formidable. Vassily, however, was now well aware that an honest person who improves himself, and does his daily work regularly, needn't cringe to any man.

The ambassador cleared his throat threateningly. "Kuznetzov. Snap out of this! What happened in there?"

"Hold your horses," said Vassily in an equable, pleasant tone. "I'm trying to think."

Smernov's jaw fell open, then snapped shut again.

Abruptly, Vassily remembered that he had been a communist. And what was communism but the desperate effort to solve by radical means the problems that arise where there are too many people who want something for nothing, and too many people who expect to get nothing for something?

"Kuznetzov," said the ambassador, a note of alarm in his voice, "do you feel all right? What did they do to you in there?"

"It's hard to explain. Do you remember the question a reporter put to Premier Khrushchev on his visit to America: If communism is to succeed capitalism, what is it that is to succeed communism?"

"Yes. Yes. What of it?'

"Well," said Vassily, "*I* know what is to succeed communism. And you must not resist it, because it is the crowning success that allows for a large degree of the withering away of the state, which, after all, is what communism is aiming at. Correct?"

"What?" said Smernov

"Yet," said Vassily, "it looks like individualism, and it *is* freedom, but it is also communism in the highest sense, because everybody is working for the common good, to each according to his need, from each according to his ability, but with no spongers or loafers, and no one man always getting the milk at the hind end of the cow while another man always had to fork the hay in at the front end, and it is capitalism, too, because that is what it is based on, capital, but—"

"Brain-washed," said the ambassador, awed.

"But," said Vassily, scowling, and feeling the discontent from

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unused muscles, and from brain cells sitting around doing nothing, "what do do?"

Vassily was intensely conscious that the best food is that eaten when a man is hungry, and the best rest that taken when a man is tired, and the best way to get hungry and tired is to *work*. But now, how the deuce—?

The ambassador was squinting at him perplexedly, and now abruptly drew a deep breath. "Kuznetzov. Enough of this! I warn you that there are severe penalties for this form of behavior! And I will not hesitate to bring them down on your head! For the sake of monolithic party unity—right or wrong, Kuznetzov—I will . . ."

Vassily scowled at the ambassador. "But that is not ideologically sound, Comrade."

"What's that?" Smernov's face turned purple. "You have been corrupted. Come along." He seized Kuznetzov by the arm.

Kuznetzov whipped loose and knocked the ambassador out. The pleasurable sensation resulting from this activity assured him that he was on the right track. He picked Smernov up and carried him up the steps. "My apologies, comrade ambassador, but you were ideologically all blocked up." He carried Smernov inside.

On the way in, the ex-bandit went out, muttering, "Got to find *work*."

Smernov looked at the nearest dentist.

"My friend," he said, "has a troublesome tooth."

The dentist helped ease Smernov into his dental chair. "Leave it to me. We will cure him."

Vassily went outside, conscious of the beauty of the day, and of all the possibilities of life.

But there was still that irksome problem of finding work.

He *could* go down and work on the housing project, and that was all right, but this was, strictly speaking, not his own country. To a degree, he would be evading his duty. And that would never do.

He was still wrestling with the problem when the ambassador came out looking dazed, glanced around at the world as if seeing it with new eyes, smiled at a pretty girl going by, flexed his arms, and looked meditatively down at the construction work.

Vassily eyed him warily.

The ambassador grinned, and banged his fist into his hand. "We're through here. No point trying to fight this. But Vassily, do you remember that collection of zoot-suited drones we saw in Moscow, who have contrived to avoid doing any work?"

Their eyes met. The idea sprang from one to the other.

"Just the thing!" said Vassily.

As with one mind, they went back, located the manager, and put the idea to him.

"Ah," said the manager, nodding approval. "Yes, what you're

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talking about is what we call an 'associate dealership.' There's no trouble arranging that, and let me tell you, it will clean up your problem as slick as a whistle. Here, come into the back room, and I'll make the arrangements for you."

"You don't mind," said Vassily, "helping out . . . ah . . . 'iron curtain' countries?"

"No, no," said the manager, "we understand each other, and it's all one world now. Besides—"

He glanced a trifle furtively around the room at a set of exerciser springs dangling from the wall, a neat desk and file case with all work obviously done right up to the minute, a complex kit-type radio set half-built, with a dozen completed sets stacked up in a corner.

"Besides," he said, "ah, though of course this solves all our production difficulties, and we've really whipped the distribution of wealth problem to a frazzle, there's still"—he lowered his voice—"a little question about the proper distribution of *work*." He laughed, then changed the subject by showing them a couple of simple confidential dealership forms. He then arranged all other details right on the spot, and escorted them to the door.

Here he paused, to speak in the low voice of a conspirator. "Now, I've helped you get started, so if you fellows run into any problems, especially any nice big tough ones with a lot of work in them, *bring them to me first*.—O.K.?"

Vassily was thinking that if he ran into any nice big problem with lots of work in it, he would keep it for himself. The manager, however, did not wait for any answer, but immediately said, "Swell. That's settled. Say, now, wait here just a minute. I've got something for you."

He disappeared into the back room, and came out carrying two nicely-finished short-wave portable radio sets. "Seven bands, swell reception. You pull up this antenna here, see? I make these from kits in my spare time. Have to keep busy. You know anybody could use one? Wait a minute."

Loaded down with portable radios, Vassily and the ambassador made their way to where they had parked their car, in one of the few shady spots around the development.

"I don't know," muttered the ambassador, "there's something about this that makes me uneasy. Here, let me carry that for you."

"No, no," said Vassily. "However, if you'd like me to carry yours–"

"Hands off," growled Smernov. "This is *my* work."

They arrived at the car, and loaded the radios into the back seat.

The ambassador said, "I'll drive going back. Move over."

Vassily's muscles were aching for exercise.

"No. *I* will drive."

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"Who's in charge here?"

"Who cares? I am your assistant. Therefore, this is *my* job. You get in back and figure out what we will do next."

The ambassador grumbled to himself and climbed in.

Vassily was hoping the car wouldn't start. Then he could go back, buy some tools, and tear it all down and put it together again. Perversely, it caught with a bang on the first turn. He swung it around and started up the road. This, he acknowledged, was better than nothing, but modern cars are so easy to drive that he failed to get much satisfaction from it.

About halfway back to town, they passed a labor gang felling trees

Vassily slowed the car somewhat.

The ambassador said, "It might be a nice gesture, you know, if we—"

Vassily slammed the car to a halt.

They sprang out and advanced upon the workers.

Intimidated, two of the workers gave up their axes.

Vassily and Smernov set to work with a will. As they settled to the job, the trees began to topple to a satisfying rhythm. They were just getting nicely lathered, however, when the workers demanded their axes back.

The edge, at least, being taken off their need for activity, they returned to the car, and out of a feeling of well-being attempted to give away a few portable radios.

The workers declined. "Thank you. But as we have not earned them, they would not be satisfying."

Vassily and the ambassador drove on, the ambassador this time insisting that Vassily ride in back.

"I don't know," said the ambassador, swinging them around a curve, "There is more to this than meets the eye at a first glance."

"But you must give them credit. They have solved the problem of increased production. One willing worker is worth far more than one who is driven. And this way, *all* workers are willing workers."

"Yes, true enough. But do you remember the fairy tale about the assistant to the magician? He got the broom carrying water—or was it a magic pot boiling porridge? In any case, at the beginning he did not have enough, but at the end he was driven out by a colossal surplus."

"Oh, well, I wouldn't worry about that. That's a long way off, and—"

The car straightened out at the end of the curve, which shifted the portable radios piled on the seat, and all but crowded Vassily off onto the floor. Silently thoughtful, he rearranged them so he would have some room.

The ambassador cleared his throat.

"I just hope," he said, "that when *this* pot boils over, they know the right spell to stop it." ■

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Beyond Pandora

The ideal way to deal with a pest — any menace — is, of course, to make it useful to you . . .

by Robert J. Martin

■ The doctor's pen paused over the chart on his desk, "This is your third set of teeth, I believe?"

His patient nodded, "That's right, Doctor. But they were pretty slow coming in this time."

The doctor looked up quizzically, "Is that the only reason you think you might need a booster shot?"

"Oh, no . . . of course not!" The man leaned forward and placed one hand, palm up, on the desk. "Last year I had an accident . . . stupid . . . lost a thumb." He shrugged apologetically, "It took almost six months to grow back."

Thoughtfully, the doctor leaned back in his chair, "Hm-m-m . . . I see." As the man before him made an involuntary movement toward his pocket, the doctor smiled, "Go on, smoke if you want to." Picking up the chart, he murmured, "Six months . . . much too long. Strange we didn't catch that at the time." He read silently for a few moments, then began to fill out a form clipped to the folder. "Well, I think you probably are due for another booster about now. There'll have to be the usual tests. Not that there's much doubt . . . we like to be certain."

The middle-aged man seemed relieved. Then, on second thought, he hesitated uneasily, "Why? Is there any danger?"

Amusement flickered across the doctor's face, turned smoothly into a reassuring half-smile. "Oh, no. There's absolutely no danger involved. None at all. We have tissue-regeneration pretty well under control now. Still, I'm sure you understand that accurate records and data are very necessary to further research and progress."

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Reassured, the patient thawed and became confidential, "I see. Well, I suppose it's kinda silly, but I don't much like shots. It's not that they hurt . . . it's just that I guess I'm old-fashioned. I still feel kinda 'creepy' about the whole business." Slightly embarrassed, he paused and asked defensively, "Is that unusual?"

The doctor smiled openly now, "Not at all, not at all." "Things have moved pretty fast in the past few years. I suppose it takes people's emotional reactions a while to catch up with developments that, logically, we accept as matter of fact."

He pushed his chair back from the desk, "Maybe it's not too hard to understand. Take 'fire' for example: Man lived in fear of fire for a good many hundred-thousand years—and rightly so, because he hadn't learned to control it. The principle's the same; First you learn to protect yourself from a thing; then control it; and, eventually, we learn to 'harness' it for a useful purpose." He gestured toward the man's cigarette, "Even so, man still instinctively fears fire—even while he uses it. In the case of tissue-regeneration, where the change took place so rapidly, in just a generation or so, that instinctive fear is even more understandable—although quite as unjustified, I assure you."

The doctor stood up, indicating that the session was ending. While his patient scrambled to his feet, hastily putting out his cigarette, the physician came around the desk. He put his hand on the man's shoulder, "Relax, take it easy—nothing to worry about. This is a wonderful age we live in. Barring a really major accident, there's no reason why you shouldn't live at least another seventy-five years. After all, that's a very remarkable viral-complex we have doing your 'repair' work."

As they walked to the door, the man shook his head, "Guess you're right, Doc. It's certainly done a good job so far, and I guess you specialists know what you're doing, even if folks don't understand it."

At the door he paused and half turned to the doctor, "But say . . . something I meant to ask you. This 'stuff' . . . er, this vaccine . . . where did it come from? Seems to me I heard somewhere that, way back before you fellows got it 'tamed' it was something else—dangerous. There was another name for it. Do you know what I mean?"

The doctor's hand tightened on the doorknob. "Yes, I know," he said grimly, "but not many laymen remember. Just keep in mind what I told you. With any of these things, the pattern is protection, then control, then useful application." He turned to face his patient, "Back in the days before we put it to work for us—rebuilding tissue, almost ending aging and disease—the active basis for our vaccine caused a whole group of diseases, in itself."

Returning the man's searching gaze, the doctor opened the door, "We've come a long way since then. You see," he said quietly, "in those days they called it 'cancer'." ■

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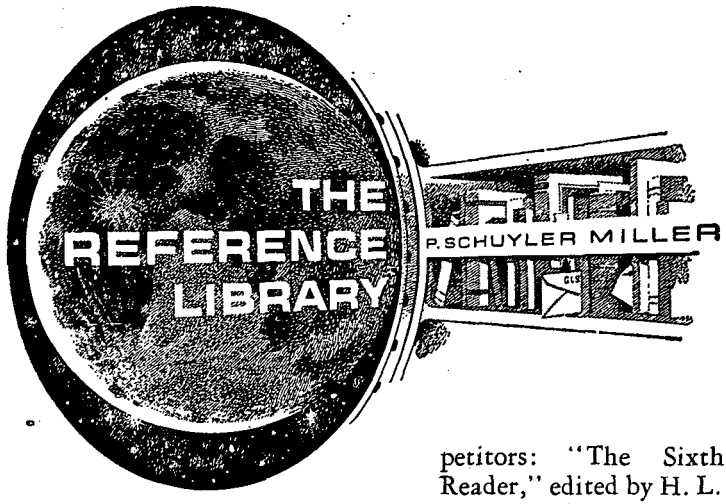

DEALER'S CHOICE

■ I don't know that anyone has commented at any length on the processes that led to the birth of an anthology. Conception may be androgynous, but it usually involves relations with a publisher or a publisher's editor, sometimes with an agent as matchmaker. The period of gestation may be very short or very long, and the labor pains brief or protracted—after all, galleys and page proofs must be suffered for about the same length of time by everybody. In view of all these uncertainties, it is a rather unusual thing to have six anthologies appearing at about the same time. Maybe—apologies to Robert Heinlein—*this* is the Year of the Jackpot.

Of the six, two are perennial selections from our friendly competitors: "The Sixth Galaxy Reader," edited by H. L. Gold, and "The Best from Fantasy and Science Fiction: Eleventh Series," edited by Robert P. Mills. Both are published by Doubleday: the *Galaxy* collection gives you 240 pages for $3.95, the *F&SF* annual has 258 pages for the same price.

Two more are paperbacks which represent the welcome reappearance of Groff Conklin as anthologist-of-the-first water. The best, and one of the best collections to come from anyone in a long time, is "Worlds of When." This is No. F-733 in Pyramid Books' growing science fiction library and supplies 159 pages for 40 cents. "Great Science Fiction by Scientists" comes from a new paperback publisher, Collier Books, which is making an impressive debut in a highly competitive field. This chunky little collection has 313 pages and costs 95 cents.

Finally, there are two impressive

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anthologies which are intended to show "ordinary" readers what science fiction is all about. They are "Spectrum," edited by Kingsley Amis and Robert Conquest, and published by Harcourt, Brace and World—304 pages for $4.50—and Damon Knight's "A Century of Science Fiction," from Simon and Schuster: 352 pages for $4.95. Among them these six books include eighty-four stories and excerpts plus two poems.

The *Galaxy* "Readers" do not pretend to be annual selections, and this one contains stories published from 1956 to 1962. There are fourteen of them, all—or almost all—with a light tone and more than a touch of fantasy. Walter S. Tevis, Jr.'s variation on the Quaker Oats box, "The IFTH of OOFTH," *is* a fantasy for my money. Louis Newman has a hilarious, deadpan study of galactic legalistics in "License to Steal" and Fritz Leiber offers a neat detective story with telepathic aliens as suspects in "The Number of the Beast." Elisabeth Mann Borgese has a completely ruthless satire of the beauty business in "True Self," and Avram Davidson and Laura Goforth tear TV drama to shreds in "Love Called This Thing," with its befuddled alien trying to live the life it has observed on the UHF and VHF. Damon Knight's "Thing of Beauty" is a grand variant on the invention-from-the-future theme—"Lex," by W. T. Haggart, complicates the super-computer gambit nicely—and Horace Gold recalls his own ability as a writer as well as editor in "Personnel Problem," which has to do with labor relations in the Asteroid Belt. Margaret St. Clair's "The Nuse Man" . . . Earl Goodale's "Success Story" . . . William W. Stuart's "A Husband for My Wife" . . . J.F. Bone's "Insidekick" . . . Rosel George Brown's "Flower Arrangement" . . . even James Blish's "The Genius Heap" . . . these all add up to an amusing and representative selection with nothing very outstanding.

You'll find far more variety in the *Fantasy and Science Fiction* volume, which covers parts of three years. Here the fantasy of Gordon Dickson's "The Haunted Village," and Evelyn E. Smith's "Softly While You're Sleeping"—the latter proof positive that there *is* something new to be said about vampires—is open and intended. The outstanding story in the book comes, not surprisingly, from Cordwainer Smith, who is never the same and never fails to score. His "Alpha Ralpha Boulevard" takes us into a nightmare future as horrible as it is fascinating . . . and there is some of the same dream atmosphere in Avram Davidson's "The Sources of the Nile." Both of these stories will be making many appearances in other collections. Poul Anderson's "Time Lag" is another of his developments of a seemingly evident relation that nobody else sees, and a subtle comment on the long, long thoughts of a woman. Isaac

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Asimov has a lovely little twist on computer warfare in "The Machine That Won the War."

The rest—all deserving description—Jay Williams' "Someone to Play With," Jody Scott's bizarre "Go for Baroque," John Anthony West's condensed echoes of domesticity in "George," Clifford D. Simak's "Shotgun Cure," John Berry's "The One Who Returns," Charles G. Finney's "The Captivity," and Kurt Vonnegut's "Harrison Bergeron," with a pair of poems by Rosser Reeves.

If the *Galaxy* collection has an over-all atmosphere of good-natured competence, this one wanders through a dream-world.

Of the two Groff Conklin collections, "Worlds of When" is by far the better, and one of the best anthologies we have had in a long time. There are just five long novelettes here, and every one is worth reading—and rereading, either for the thought around which it is built or just for pleasure. Chad Oliver's "Transfusion"—here in June, 1959—leads up to a good gobbet of anthropological meat through a puzzle: why mankind has no past when the time-travelers go to look for him. Fritz Leiber's "Bullet With His Name" is an ironic comedy of misused super-powers. Arthur C. Clarke's "Death and the Senator," here in May '61, is a quietly human story about one of the possible uses of a space station. Mack Reynolds' "Farmer" is a sober, down-to-earth story about the salvage of the Sahara, and Margaret St. Clair's "Rations of Tantalus" projects our pill-stuffed pharmaceutical society to a grim fate. No fireworks, really—just solidly good stories all 'round.

"Great Science Fiction by Scientists," on the other hand, pretty well proves that fiction should be left to writers, who may also be scientists with names like Clarke, Asimov and Oliver. The scientist-authors are presented alphabetically, from Asimov and Bell to Szilard and Wiener, and two of the stories are new: Chan Davis' "Last Year's Grave Undug," a brutally frank story of unburied ideologies in a devastated America after War III, and "John Sze's Future," by John R. Pierce, a wry little comedy of cross-purposes. Willy Ley is here with a fair but dated story, "A Martian Adventure," published here in 1937 as the work of Robert Willey. It's Gernsbackian science fiction, packed with information on Martian conditions and interplanetary orbits.

J. B. S. Haldane, with "The Gold-Makers," shows himself a better storyteller than Julian Huxley, whose "The Tissue-Culture King" may be closer to what is supposed to be the norm of science fiction but is short on craftsmanship if long on gimmicks. Leo Szilard's "Grand Central Terminal" is a comedy of archeology, Louis N. Ridenour's "Pilot Lights of the

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Apocalypse" is a warning of how war can come, Norbert Wiener's "The Brain" has a plot that hinges on its science as a good SF yarn should, Ralph S. Cooper's "The Neutrino Bomb" is a parody of politico-scientific thinking, and James McConnell's "Learning Theory" is a nice variant of the we-are-property genre.

We are left with the scientist-writers who are more or less pros in both fields. From Isaac Asimov, a slight fantasy, "What If . . . ," where one of his robot stories would have been a more interesting choice. Eric Temple Bell—"John Taine"—is wildly melodramatic in "The Ultimate Catalyst," one of his very few short stories. Miles J. Breuer's "The Gostak and the Doshes" is an early semantic classic with a framework of relativity. Chad Oliver has a nice one, "The Mother of Necessity," on an era when our mania for fads extends to new-model societies. Robert S. Richardson has a very human little story about a robot fighter, and Arthur S. Clarke is close to his average but not at his best in "Summertime on Icarus." On the whole, the stunt is not a success.

Finally, we have the two more serious collections, one by an English editor, one by America's most critical critic.

In "Spectrum," Kingsley Amis—author of "New Maps of Hell," the much-discussed review of science fiction, and of a number of novels—and Robert Conquest, an English poet and political commentator, are trying to show the general English reader what science fiction is like. In their introduction they rather talk around what they believe science fiction to be, without making clear what they hope their selections to illustrate. They have arbitrarily left out English work on the ground that it may be too familiar to British readers.

The book begins with a classic, Frederik Pohl's "The Midas Plague," that vivid nightmare of the Horn of Plenty. It ends with another, Robert A. Heinlein's "By His Bootstraps," which is an idea-as-hero gimmick story. Katherine MacLean's "Unhuman Sacrifice"—also in the Knight anthology—is developing into a classic on the dangers of judging another species by your own criteria. Clifford D. Simak's "Limiting Factor" is a puzzle story, and a very good one—perhaps the closest to "hard" science fiction in the book—with a final irony that is perhaps the gentlest and most subtle final hook we've had in a long time. Algis Budrys' "The Executioner" shows us how the laws of a society are shaped by its structure—and react on it: this is another classic-in-the-making. William Tenn's "Null-P" is a brief satire of mediocrity; Stephen Barr's "The Homing Instinct of Joe Vargo" introduces an other-world monster utterly unlike anything in the movies; and John Berryman's "Special Flight" is a would-be documentary of the

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"serum to Nome" school in which everything that can happen to the rescuing heroes does.

In "Inanimate Objection," H. Chandler Elliott is verging on fantasy with his concept of life in the inanimate. And Robert Sheckley, in "Pilgrimage to Earth," satirizes the tendency of our centers of civilization to degenerate—or evolve—into corrupt play pens for the moneyed hinterland.

All these are good stories, as the editors say. The element of social satire is strong, and from Mr. Amis' "New Maps of Hell" we know he considers this one of the major elements in science fiction. Even so, this is a flat and poor example of the variety of modern science fiction compared with our final anthology, Damon Knight's "A Century of Science Fiction."

August Derleth, a number of years ago, tried to assemble an anthology that would trace the history of science fiction. The result, "Beyond Time and Space," was scholarly but dull. Damon Knight, by a judicious combination of excerpts from old or long stories and representative new ones, succeeds where Derleth failed. His section on robots, for example, begins with a bit from Stanley G. Weinbaum's "The Ideal," describing Bacon's legendary automaton, then goes on to Ambrose Bierce's "Moxon's Master," which establishes the stereotype that a machine complex enough to act like a human will also act human. In Isaac Asimov's "Reason," such a robot becomes entangled in its own introspection, and in the last of the stories in this section, Brian W. Aldiss' "But Who Can Replace a Man?" we see that the machine, however complex, is still a machine.

The paradoxes of time travel are less well covered, but the main threads are all there. A bit from Wells' "Time Machine" explains the concept, then Alfred Bester, in "Of Time and Third Avenue," offers a beautiful little bit on the man-from-the-future in our time. Philip José Farmer's "Sail On! Sail On!" takes the parallel time-tracks concept to its outrageous ultimate, and a bit from Keith Laumer's recent temporal adventure yarn, "Worlds of the Imperium," suggests what it may be like to travel across these diverging tracks. Mack Reynolds, in "The Business, As Usual," mocks the day when time travel becomes routine.

Because the next two categories, "Space" and "Other Worlds and People," comprise a very large part of all science fiction, they are less well represented. But who could want a better story about men in space than Edmond Hamilton's "What's It Like Out There?"—one of the all-time bests—and who with any religious feeling can avoid the perplexities of Arthur C. Clarke's "The Star?" The third space story, Robert A. Heinlein's "Sky Lift," is a near-documentary. Wells introduces the "other worlds" theme

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with "The Crystal Egg," and Marion Zimmer Bradley with "The Wind People" and Katherine MacLean with "Unhuman Sacrifice" suggest the strangeness of other races as they are contrasted with ourselves.

Fitz-James O'Brien's "What Was It?"—written in 1859—is both a pioneering short story and an excellent prototype for the "aliens among us" section of the book. Here horror is unseen; in "The First Days of May" by the French SF writer, Claude Veillot, it is all too clearly and explicitly seen, as extraterrestrial mantises eat their way through mankind. Theodore L. Thomas' "Day of Succession" is a ruthless little answer to the question, how do we know if they're friendly? Finally, "Angel's Egg," by Edgar Pangborn, is pure charm in its picture of an utterly alien little creature who has come to offer treasures to hens and men.

Supermen are another of the science fictional stereotypes. They are represented here by "Another World" by the French writer, J.-H. Rosny ainé, which describes the tormented childhood of a man ahead of his age, a selection from Olaf Stapledon's classic "Odd John," and by Poul Anderson's "Call Me Joe," as understanding of ordinary men as of the superbeing they have made to live on the face of Jupiter.

The gadget section on "marvelous inventions," though synonymous with science fiction in many minds, is one that Damon Knight seems to find unattractive. At any rate, it is the poorest in the book. Mark Twain's "From the *London Times* of 1904," written in 1898, satirizes the society of his day through an account of the telelectrophonoscope and the part it played in a famous criminal case. A selection from Verne's "Twenty Thousand Leagues Under the Sea" shows that author's use of technology to make a story realistic. Will Stanton's "You Are With It!" is a nightmare of the TV-centered society, and Frank Herbert's "Cease Fire" describes the invention of another ultimate defense.

You will certainly think of stories in each of these categories that might be more representative of trends in science fiction, or of other stereotypes and themes and lines of development. Damon Knight has high, hard standards and whole areas of science fiction are undoubtedly ruled out by them. Nevertheless, this anthology proves that good science fiction can always be good reading—that it need not be pretentious to be thoughtful.

Of these six, give me Knight's "Century," Conklin's "Worlds of When," and the *F&SF* selection and I'll be quiet for a year—or until Judith Merril's anthology comes along.

THE VOICES OF TIME, by J.G. Ballard. Berkley Books, N.Y. No. F-607. 158 pp. 50¢

Damon Knight has already filed a prophet's claim on the author of

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this collection by calling him "the freshest new talent in science fiction since Brian Aldiss." Best I can do is call this the best one-man collection we are likely to see in 1962. The seven stories are all from the English magazines, *New Worlds* and *Science Fantasy*, and they are as good as anyone is writing now.

The title story is pure nightmare, where things happen seemingly without meaning but with a sense of significance, where symbols may have many meanings or none, and where the universe is crumbling. It suggests that the laws of the universe may be capricious or may go insane. "The Sound-Sweep" is unabashed fantasy about a deaf-mute who sweeps up unwanted sounds, and his campaign to have a once-great singer get a new start. Nonsense? Perhaps—but the author makes you believe it all. "The Overloaded Man" can be considered a "straight" story of the growth of an obsession—of insanity—and perhaps that is the rationale of "Zone of Terror," whose protagonist finds himself a little displaced in time, so that he sees himself, and then spies himself spying on himself.

"Manhole 69" picks up another theme that has been popular recently: men who can do without sleep. But the result is grim and mad—and powerful. Then there is one of the strangest of other-world stories, "The Waiting Grounds," and finally "Deep End," more conventional than the rest, in which a young man must decide whether to leave an Earth from which the seas are all but gone.

These are all stories with intense emotional drive behind them. They draw on the fantasies of hallucination, of madness, of nightmare. They pull men's minds out to the snapping point and make them twang. Like Brain Aldiss, the author's short stories are still better than his longer fiction. I hope he will not grow away from us too fast.

THE ELEVENTH COMMANDMENT, by Lester del Rey. Regency Books, Evanston, Ill. No. RB-113. 159 pp. 50¢

Lester del Rey, once one of the "stable" of regulars here in Astounding and in *Unknown Worlds*, has been relatively quiet for a long time. He is making an impressive comeback with this original novel about a future America utterly controlled by the American Catholic Eclectic Church and by its Eleventh Commandment: "Be fruitful and multiply."

We see this nightmare earth over the shoulder of an exiled Martian cytologist, Boyd Jensen, whose scrambled genes are too monstrous for his conservative society. The Church has begun to take over the world after the decimation of atomic war, and has succeeded all too well. Doctrines against contraception made double sense: they helped to repeople the Earth, and to repeople it with the children of the Church. Thus, by 2190, a crowded, impoverished, psycholog-

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ically contorted society has developed, in which Jensen can find no real place. All research on life is relegated to the Church; the only real law is Church law.

Needless to say, Jensen is perpetually in trouble, and every clash with authority reveals some new, horrid facet of the corrupt religious society. Yet his skills are needed and are recognized, and he gradually makes a place for himself. And in the end he sees behind the obvious . . .

It's a powerful, troublesome story that may stir up Church opposition on doctrinaire grounds, especially in readers who don't finish it, and who do not get the scientific message.

THE LANI PEOPLE, by F.F. Bone. Bantam Books, N.Y. No. J-2363. 152 pp. 40¢

This first novel by a relatively new writer is also an original. Its theme, however, is not new: it is the question raised recently in H. Beam Piper's charming "Little Fuzzy" and in Vercors' "You Shall Know Them"—what is Man?

Veterinarian Jac Kennon, one of the genetically strange and sociologically conservative Beta people, is employed to handle veterinary problems on a plantation where the Lani are bred for sale. They are women—seemingly identical with human women except for long prehensile tails—but the courts have declared they are animals, and they are raised and sold as slaves. Kennon's Betan conditioning will not let him indulge in sexual relations with any of them, but he soon has plenty of medical problems on his hands. Then he discovers that there really are Lani males, but that they are penned away and bred as rutting brutes. And he learns of Lani traditions that suggest they are mutant descendants of missionaries from his own world.

The medical aspects of the story are made fascinating and a legitimate part of the puzzle. The Lani are perhaps so many naked props, but Alexander, the villain of the piece, emerges as its most real character. And there is a statement by one of the Lani, thrown away in the middle of the story, that is worth remembering:

"You can't possibly be civilized until you take responsibility for intelligent life other than your own race. Until you face up to your responsibilities you are merely a member of a dominant race, not a civilized one."

THE MAKESHIFT ROCKET, by Poul Anderson. UN-MAN AND OTHER NOVELLAS, by Poul Anderson. Ace Books, N.Y. No. F-139. 97+158 pp. 40¢

All of the four long stories in this book were first published here in Astounding/Analog. Readers of 1958, for example, can hardly forget the outrageous adventures of Knud Axel Syrup, chief engineer of the *Mercury Girl*, and his efforts to escape the wild Irish Shamrock Expeditionaries in a spacecraft propelled by beer bubbles . . . or the

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six-legged Martian bartender in *lederhosen* . . . or the classically garbed Emily.

On the flip side, they're likely also to recall the matter of the UN-men—the Brothers—who use unorthodox methods to keep the peace of the world. Then there is "Margin of Profit," in which a hard-headed space merchant copes with pirates, and "A Live Coward," in which the Space Patrol's rule against killing calls for some fancy skulduggery.

Every word of every one of these outrageous yarns is enjoyable. Deep sociological lessons? Maybe not—but plenty of practical psychology, plenty of action, plenty of color. Books like this may win back the youngsters who didn't know it could be fun to read.

THE THREE SUNS OF AMARA, by William F. Temple; THE AUTOMATED GOLIATH, by William F. Temple. Ace Books, N.Y. No. F-129. 80 + 143 pp. 40¢

It's a long time since we've heard from William F. Temple. English readers haven't been similarly deprived, for I believe both these stories originated in one of the three British science-fiction and fantasy magazines.

"The Three Suns of Amara," really only a long novelette, is a variant on the hero stories of long ago in which a champion must struggle against a succession of monsters to win a goal. In this case, a spaceman simply wants to change ships. To do so he must cross a section of a strange planet on foot, and to do that he must face peril after peril, not the least of which is a beautiful maiden who diverts him from his goal. Monsters, landscape, people—all are utterly strange and totally believable at the time we encounter them.

"The Automated Goliath" is another "underground" story. Aliens have infiltrated the English government, and a handful of stalwarts resist them. Domination has come in the guise of automation, and the few who control Goliath control the world. The action is lively and logical, or anyway plausible, and the victory is not too easy.

Praise be that English writers haven't forgotten science fiction can be fun.

PLANET OF PERIL, by Otis Adelbert Kline. Avalon Books, New York. 1961. 224 pp. $2.95

Otis Adelbert Kline was the best of the Burroughs imitators; I am told that Burroughs himself said so. By 1929, when "The Planet of Peril" was serialized in *Argosy*, the popularity of Burroughs' Mars series was well established; six of the John Carter stories had appeared. Kline consequently took Venus as "his" planet and explored it in the three Robert Grandon books: "Planet of Peril," "Prince of Peril," and "Buccaneers of Venus" for *Weird Tales* in 1932–'33. The latter was called "Port of Peril" in the Grandon book edition; the first two books were brought out by McClurg, so that this is a reprint.

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Kline's two Mars books, inferior both to Burroughs' and to his own Venus stories, followed the Grandon adventures. Avalon, however, published them first, and this edition has consequently been revised somewhat to make them precede Grandon's transfer to the body of a Venusian by the same man and process used in the previous books.

Venusian society, like that of Kline's and Burroughs' Mars, is a mixture of advanced science—developed more in the later books—feudalism, and monster-fighting. Slavery is taken for granted; women are beautiful; villains are totally despicable; monsters are most fun of all. Aircraft—rather like Burroughs'—are operated by telekinesis. After suitable daggery and skulduggery, Grandon finds himself a captive of rather advanced termites; these cannot, however, come up to the brilliant ants which Ralph Milne Farley had reported from Venus in his "Radio Man" series.

I haven't been able to compare this Avalon version with either the *Argosy* serial or the previous book version, but judging from the reported length of the McClurg book and what I remember of the two Mars stories, I suspect this has been somewhat shortened. Please correct me if I am wrong.

PLANETS AND SATELLITES, edited by Gerard P. Kuiper and Barbara M. Middlehurst. University of Chicago Press. 1961. 601 pp. $12.50

This is the third volume in the definitive study of the solar system, which began in 1953 with "The Sun" and continued in 1954 with "The Earth as a Planet." Two more volumes are planned: Volume IV on "The Moon, Meteorites and Comets" and Volume V a reprise on "Planets and Interplanetary Medium."

If you hope, as I did, for an up-to-the-minute summation of astronomers' ideas about the several planets, you will be thoroughly disappointed. Volume V may give us that, but the current treatise doesn't. Instead it is that increasingly common work, the scholarly symposium, in which a batch of specialists—nineteen of 'em, in the present case—throw in their ideas on their own specialties.

When such a symposium volume results from an actual symposium, at which the specialists were present and exchanged ideas in open discussion which is recorded and printed, the results are often exceedingly fine. You'll find ideas bandied about, advanced and refuted, that would never get into print in any other way. However, when the papers are merely contributions to a volume on a general theme, as in the present case, there will usually be some overlapping, possibly some contradictory arguments, and most often great gaps not covered by anyone.

If you are interested in the state of our knowledge of Mars, for example, you will find the greatest amount of material in two chapters by the French astronomer, Audouin

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Dollfus. One describes the program of planetary photography and mapping at the great Pic du Midi Observatory in the Pyrenees, with a fat wad of drawings and maps by way of illustration, while the other describes the Pic du Midi polarization studies.

For an idea of the coverage of the book, it opens with some comments on the Earth as seen from *Tiros I*, goes on to Clyde W. Tombaugh's account of his search for trans-Neptunian planets and additional satellites, and goes on to studies of planetary and satellite masses, planetary interiors, technological problems of measuring and photographing the planets, temperatures, radio emission—with two chapters on Jupiter—and a fat chapter on celestial mechanics. There are color photos of Mars from South Africa, and more with the 200-inch telescope at Mount Palomar. The chapter on celestial mechanics is Japanese. The possibility that Jupiter and Saturn are chunks of solid hydrogen is presented.

It will take anyone but a specialist a long time to pry out, chew up and digest the meat in this weighty compendium of facts and theories. This is something you should persuade your public library to put on the reference shelf where you can browse through it from time to time.

SILENCE IN HEAVEN, by Michael Erlanger. Atheneum Publishers, New York. 1961. 169 pp. $3.75

This little book is as unclassifiable in its way as Ernst Juenger's "The Glass Bees" or Rene Daumal's "Mount Analogue." It uses the trappings of science fiction—ultimate weapon, last ten people on Earth, search for other survivors—and fantasy to satirize the degradation of trends visible in our own time and projected into the future, where they can be enlarged to wide-screen proportions. It has a surrealistic disregard for plausibility and regard for bizarre character. Its author is a business executive who is also a painter, sculptor, traveler, and now allegorist.

The Great Sigh—the never-described weapon or cataclysm that reduces almost all life on Earth to dust and bones in a passing instant, and shrinks the planet itself to an exurban parcel—leaves ten people alive. Unlike such books as Thornton Wilder's popular novel of the Twenties, this is not an attempt to show or inquire why the ten were spared. They encounter each other, they wrangle, they recall or probe into the social and psychological obscenities of their "normal" life before the Sigh. Eight of the ten are in the United States, and seven of these are old. In the end they set out on a transatlantic quest, following the seventeen-year-old Lilith until she finds her age-mate and father of the new race they will start, painting with his own blood in the hills of Greece.

Apart from the overt satire, every reader can read what he likes into the symbolism of these twisted people and their relationships.

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John W. Campbell

ANALOG, Research Dept.
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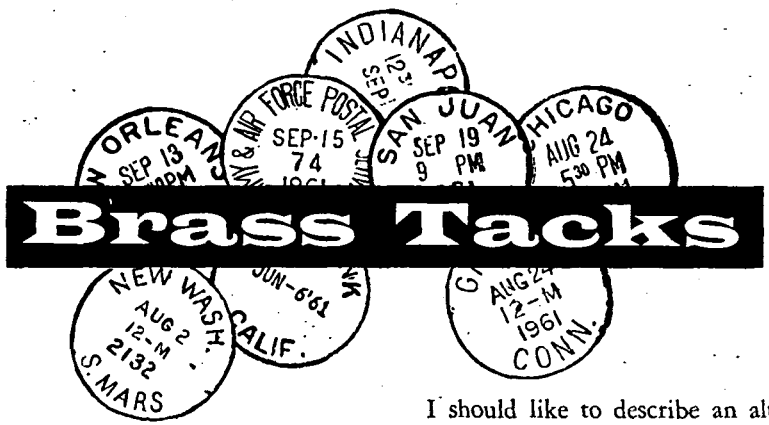

Dear Mr. Campbell:

In your editorial in the May, 1962 issue of Analog, you continue on a theme previously discussed in your magazine, namely, what's wrong with "American Science." Your views on the subject, while somewhat exaggerated, are quite true in many cases. However, there is one point on which I wish to comment.

You have asked the question "What can American Science offer the students?" and have discussed the supposed lack of science majors from the point of view that students, after seeing what science has to offer, will tend to go into other fields, such as business, because these fields offer more opportunities for original thought, and so on. The case mentioned, of the man who obtained his Bachelor's in Physics, but took graduate work in Business because of intellectual lacks in science, supposedly typifies the ideas of contemporary science students.

I should like to describe an alternative method for obtaining intellectual satisfaction, which also permits a man to remain in the field in which he is most interested. This method, while perhaps unorthodox, offers, I believe, a more reasonable path for a student. Of course, I may be prejudiced, since I am presently following it myself.

American Science, both in government and in universities, suffers from a lack of freedom of thought. In undergraduate curricula, emphasis is placed upon gross memorization of facts and formulas, many of which are better left to be looked up as needed, with no, or very few, opportunities for the development of the proper ways of thinking and the inquiring mind so necessary to good research. In graduate school, somewhat greater opportunities for independent thought are presented, but there is still a great lack of encouragement along these lines. However, the student with the proper type of mind can avoid the pitfalls presented

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by the majority of Approved Science, as you have called it, and thus develop his own abilities properly.

I am presently working towards a Ph.D. in Physical Chemistry at a well-known eastern university, having recently obtained a B.S. in chemistry from another. While this may seem to be the action of one intent on joining the ranks of Approved Science, it is not. You see, I am not now, and will not be, until I have obtained the Ph.D., in a position to question the dictates of Approved Science, since Approved Science only permits internal criticism. This criticism must come from within the union, so to speak, and the Doctorate is the union card. Together with some of my colleagues, I have often questioned some of the approved laws of modern physics and chemistry, and we have even begun to prepare a new theory of force interactions and particle motions, which, incidentally, has some points in common with the theories discussed by Dr. Davis in the May issue of Analog.

We dare not publicize these theories at the present time, since such "heresy" would preclude any possibility of our obtaining the Doctorate, so we present a front of attentively learning and believing the concepts taught in the university, and shall continue to do so until we have obtained our union cards.

I believe that this path is the only one which is truly consistent with the scientific mind, since only in this way can one remain in science. The idea of switching to business after examining the possibilities of science smacks strongly of defeatism. The man you discussed has effectively chickened out.

Incidentally, with regard to the article by Dr. Davis, I might say that I was amazed to find it in your magazine. While it is true that you have consistently championed the publication of such "unorthodox" ideas, and while you have attempted to provide a place for their publication, I am surprised that Dr. Davis would allow first publication of such revolutionary ideas in Analog. He has unfortunately placed himself in a position from which he can easily be discredited, by publishing in Analog, since the doctrines of Approved Science forbid even consideration of ideas published in magazines containing such "trash." In addition, the language in which he has couched his mathematics would also serve to partially discredit his work, since it is too simple. While I have been an avid reader of Astounding-Analog for many years, and while I feel that you are doing very good things for

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both science fiction and science, I feel that you yourself should have warned Dr. Davis of the problems he has let himself in for by publishing in Analog.

To conclude, may I congratulate you on the excellent work you are doing, and pray that you will continue it in the future, but please, temper your ideas with a little practical politics, to prevent such problems as Dr. Davis may encounter.

If you should care to publish this letter, I would appreciate your withholding my name, since publication of such "unorthodoxy" over my signature would also preclude and prevent my Doctorate.—Name withheld as requested.

Dr. Davis knows what he's doing. It is important that these new ideas be worked with quickly. It takes eighteen months to two years to get a paper published in the standard journals. Since Dr. Davis does not need to acquire status—he's interested in results, not kudos!—and Analog's *readership includes a large fraction of the most open-minded and active research minds in the country—* Analog *is a very efficient medium for his purpose.*

Also, remember, Analog *is by no means Dr. Davis' only route of communication! Several formal papers on the work are being presented, too.*

» » »

Dear Mr. Campbell:

Re: The Fourth Law of Motion

Congratulations! If you pull this one off, you deserve as many plaudits as those directly concerned. This is advertising in the grand manner, this is the type of publishing that we really need in all fields. "Freedom of the Press" is just as positive a thing as any other virtue, the negative attribute of freedom from restraint is worthless unless the freedom so gained is used.

I would not be so hard on American Science. The problem lies not with American Science but with the whole climate of American thinking. We have retreated from attack on all problems to a position of fearful grasping for "security." We see Commies under every bed and the National symbol has become the psychiatric couch. Our trouble is typified by the bomb shelter equipped with guns to keep out our neighbor. Freedom cannot live in a climate of fear and distrust. Either the American Culture becomes dynamic again or we will be pulled, kicking and screaming, into a future we have had little part in designing.

Back in the "twenties" we built crystal sets and dreamed big dreams. Marconi and Edison were heroes—maybe Edison wasn't a "scientist" but his pragmatic approach to the Universe developed a lot of technology. Who is being revolutionary now? I think most of these people are writing sexy novels—this is one place you can still make a fuss without being looked upon as a traitor.

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My amateur science may be somewhat less than important but I have long refused to be overawed by the scientist simply because of who he might be. I have great admiration for a man who makes a practical contribution in any field. To Mr. Dean, to Dr. Davis and to all who had a part in this accomplishment I offer my thanks. Whether or not a Space Drive directly results from study, I know the work will greatly aid in our knowledge of Motion. I have utmost faith in an eventual success of a Drive of this nature—I only hope it is an American discovery.

Incidentally, I'm still wondering about the effects around a generator. How is Psi mixed up with Gravity? There are untold numbers of questions, all we have to do is ask them. How do you find answers without asking the questions?—Henry N. Stone, 938 N. McKean Street, Kittanning, Pennsylvania.

The current general attitude, however, is "Who wants questions? You might not like the answers!"

» » »

Dear Mr. Campbell:

After reading your reasoned editorial in the April issue—even though I didn't happen to agree with all the reasoning—I was unpleasantly shocked by the illogical and emotionally colored answer you made to one of the letters.

The gist of the letter was the statement, "A bill has just been introduced to reduce the literacy requirements for voting." You apparently shared the letter writer's distaste for the bill, but you very unscientifically equated illiteracy with feeble-mindedness in your sarcastic agreement.

The two are not the same, as you well know. Furthermore, in apparently championing any literacy test for voting, you are treading on very thin political and logical grounds. *Why* should a citizen in this or any democracy have his right to vote determined by whether he can sign his name or read? Is he to be lumped—as he evidently is by you—with the feeble-minded, the felons, and the idiots, who are already prevented by law from voting?

If we say a man must pass a certain literacy test, we open great possibilities of abuse, to wit:

1. In the South the literacy test has often been used as a means to prevent Negroes from voting, regardless of their educational level. Don't take my word for it—dozens of competent outside observers have attested to the practice. In some cases, the literacy test is administered in such a way that college graduates would be hard put to pass it.

2. A literacy test places an unjustifiable qualification on one of the basic rights and responsibilities of citizenship—however lightly critics may take it—the right to vote. The fight for universal suffrage in this country has been a long and hard one. First, the founding fathers had to overcome the wishes of conserva-

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tives to place a property qualification on voters. Negroes did not gain the vote until the Fifteenth Amendment, women not until the Nineteenth, and the abolition of the poll tax is only now the subject of a proposed Twenty-third Amendment. Why must we deprive the illiterate —who surely must pay his taxes, the same as you and I—of the right to vote, when the only thing he may be lacking is the acquired attribute of a certain section of knowledge? His IQ may be as high as yours, his judgment as keen, his perceptions as careful—not necessarily, mind you, but possibly. To imply that he does not gain judgment to vote until he can read a few lines is ridiculous—how much judgment would then be gained by those who never read a book or magazine from the day they leave high school? To send the illiterate down the same voteless road as the "Duh-Duh" guy of your snappy reply is senseless. *Seven out of ten* people in the world are illiterate. Does this mean they should be deprived of all hope of self-government until they learn to read and write? I fervently hope not.

3. In imposing a literacy test, the next logical step is to impose a *higher* test of knowledge. Suppose only college graduates were allowed to vote—you and I and all the other college and university alumni would enjoy the franchise, but how many millions would you eliminate? Or, suppose they eliminated people with predominantly scientific educations as unfit to vote on the grounds they knew little of politics and cared less? You can see to what mad ends such a perversion of the literacy test could lead.

There is no doubt that a government can be more "efficiently" run with certain types of close state control than with our own democratic system. But we are saddled with it, in all its bungling, quarreling, inefficient magnificence; and I for one hope it is never replaced. Not with a government of scientists, philosopher-kings, or commissars. Historically, it has time and again proved not only worth speaking up for, but fighting for. Let us hope that, in this nation at least, there will always be millions to do both.—David Gabriel, P.O. Box 563, Delano, California.

Idiocy does not disqualify a voter, my friend!

The only thing that keeps a lot of otherwise legal idiot voters from the polls is literacy.

I do not say all illiterates are idiots—but I do hold that a man who won't take the trouble to learn to read has not earned the right to vote, and one who is incapable of learning should not be permitted to.

I am aware that literacy tests can be perverted—but let's eliminate the perversion, not the tests.

» » »

Dear Mr. Campbell:

Mack Reynolds' story "Mercenary" is interesting, but it would be neces-

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sary to go back quite a while in military history to dodge "mass murder" weapons, and even then, people got clobbered wholesale.

The Mitrailleuse was actually much less efficient than any of the machine weapons used in the Civil War here, such as the early Gatling, the Ager "Coffee Mill," or the Williams 1 pounder, CSA, first practical machine gun used in combat. It was not only clumsy, but misused, giving rise to a belief that MGs were no good. The recoil operated Maxim, the 1895 Colt, and the prototype of the Hotchkiss were all in use much farther back than we realize.

Aerial recon dates back over one hundred years. The French Revolutionary army tried hot-air balloons briefly. Professor Lowe did some scouting from captive balloons in 1862-63. And the Austrians tried aerial bombing in 1849 against Venice! Aerial combat dates back to 1870, and the Prussians had anti-balloon mounts set up on the ground.

Scout reports do not mean everything. Intelligence has to be evaluated and acted on properly before it is any use. Sometimes things in plain sight escape the majority of observers such as the performance of the Flak 88 in Spain in 1936 or so. Or the loss of contact with a Jap task force in November 1941.

Weapons are important, but the user also makes a difference. Then also, we have tactical systems, which present a problem till the facts are studied and properly acted on. Back in 1346 an inferior English force was brought to bay by the French. They paid little heed to missile arms, and made a mighty charge at the English knights, past ranks of Welsh and English bowmen. Few of them made it. For the next fifty years, the thing kept on, till it got to be habit-forming, and the French ran out of hotheaded knights. They solved the English tactical puzzle by use of cannon and plastered the bowmen from out of arrow range.

Genghis Khan and his successors were the operators of tactical systems which few people could match in the mid-13th century. The Mongol horsemen still hold many of the records for long movements and drastic action against cumbersome feudal troops.

For modern ideas, read up on Jan Zizka, the Czech wizard of the 1420s. His system did not last long, but was unbeatable while it lasted.

Regardless of limitations, some smart-Aleck will always find a way around the rules, or the fortifications, or the enemy troops, and then Hi, Yo, Silver! Away, and after the QM and Ordnance far in the rear . . . John P. Conlon, 52 Columbia Street, Newark, Ohio.

War is, was and always will be The Department of Dirty Tricks!

» » »

Dear John:

I have read in the February issue of Analog and noted in particular the letter written by Joseph F.

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Goodavage—especially the similarity of events. In Europe the temperature is not as he predicted, but it is a very bad winter over here. We have had a lot of snow and cold temperatures. You know already of the high winds that have run rampant over the Northern German area. From what I read in the newspapers the weather in the States is just as bad. Let's hope the differences of the nations of the world are solved. I do not like being always prepared for war and I wish that the nations of the Earth would grow up and act their age.—PFC Edward P. Lubomirski, Jr.

Too bad Goodavage's political predictions weren't as accurate as his weather forecasts. On weather, it looks as though Astrology beats Meteorology, as of 1962!

» » »

Dear John:

Being a professional pessimist, I noticed one more hole in the doughnut than you brought out in your fine article on the Edison Cell and Ni-Cd batteries.

It's this: The electrolyte from a lead-acid storage battery will eat holes in your clothes and corrode metal. The concentrated KOH electrolite in an Edison cell battery won't do this, but it *will* eat holes in YOU.

Edison cell batteries are extensively used to power miner's cap lamps. They are usually worn on the hip, toward the rear, and take a horrible beating. Once in a while the sealed case springs a small leak. When this happens it becomes noticeable almost at once. Almost, but not quite! By the time the alarm signal has worked its way upward and been evaluated causing you to put a hose in your back pocket and turn on the water the damage has been done, and you have a nice blister to remind you for the next week or so to check your battery more carefully in the future!

For AnLab: 1. The Circuit Rider 2. Mercenary 3. Toy Shop. 10. A Slave is a Slave—nothing but a rewrite of one of your editorials, and comes in tenth place, after everything else in the table of contents. The editorial was good, as usual, but the rewrite didn't measure up to it.—Sfc. Eugene J. Allen

You think sulfuric acid doesn't chew holes in human flesh? At least spilled KOH will, in a few hours, become harmless K_2CO_3; sulfuric acid will lie in wait for weeks!

» » »

Dear John:

While appreciating deeply the many flattering statements made in your editorial entitled "That Fourth Law of Motion" in the May issue of Analog, I feel there are certain points with which I would like to take issue.

First of all, I do not honestly consider it proper to describe our proposed modification to the Laws of Motion as a "breakthrough." At this stage, it is clearly still only a hypothesis and I suspect a great

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deal of experimental research will have to be done before it will be possible to decide whether this is a meaningful theory or merely another unsuccessful hypothesis.

As a former professional government science administrator for six years, I feel I must say a word in defense of my erstwhile profession. There are many government agencies established for the purpose of supporting research, both basic and applied and there are many others who have the authority to contract for the procurement of manufactured hardware. So far as I know, there are no federal agencies who have either the authority or the funds to buy inventions. Having attempted to solve this problem by the creation of a group in the Air Force office of Scientific Research and having seen an enormous amount of time and effort in reviewing innovations result in no achievement whatsoever, I have come to the conclusion that this function probably cannot be and should not be performed by the government. The outstanding successes of the past indicate that our own free enterprise system is probably the best answer. The way to increase invention and innovation in my opinion is to liberalize the patent law to provide the inventor with a better probability of reward and to modify existing government procurement policies which in general do not provide for the safeguarding of proprietary inventions unless covered by an issued patent. In other words, the best way to encourage invention is to offer the inventor the opportunity of earning the reward to which he is rightfully entitled rather than offering a handout at the whim of an all powerful government.

Finally, I find some inconsistency in your extolling of the individual on the one hand and your insistence that Science respond as a group to innovation. For example, in the case you mentioned concerning the Dean Drive, at least one and probably a number of scientists did respond. If the government failed to recognize the meaning of this type of innovation, at least one corporation was willing to support research in the field. I believe this is all we can logically expect.—William O. Davis, Director of Research, Huyck Corporation, 200 East Forty-second Street, New York 17, New York.

Science-as-an-entity is inconsistent. It did indeed respond as a group to the Dean device—it loudly and officially and authoritatively condemned it.

Does Science, any more than an individual man, have a right to impose an uninformed—uninformed because they did not study the device before pronouncing their verdict—opinion?

When I went to school, I was taught that the Galileo mess established the proposition that no authoritative body should impose opinions without investigation.

Many individuals, in Galileo's

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time, did investigate and accept Galileo's reports—but the Official Authorized dogma made things most unnecessarily difficult.

Agreed in full that a free-enterprise system, and a patent law that really protects the innovator is the best answer yet discovered. That's what I want—the system we had seventy-five years ago!

» » »

Dear John:

Dr. Davis and I were finally able to settle our arguments over the equation that appears in Figure 4 of our article entitled "The Fourth Law of Motion" in the May issue of Analog only after I studied the equations—which are incidentally the Lagrangian form of the third derivative law and the differential equation of the angular motion of an orbiting body—as they were recorded by the camera.

After noticing the missing dot that was *not* on top of the θ on the second term of the differential equation, we realized who was right.

May I also correct equation 17 by squaring the term $\dot{a}_o$.—Ebrahim L. Victory, Huyck Corporation, 200 East Forty-second Street, New York 17, New York.

Well, that's one slip our staff wasn't responsible for!

» » »

Dear John:

Analog's advertising promotion booklet was exceedingly interesting. I have always known that a great number of scientists and engineers were avid readers. I even suspect that in some cases your magazine also serves as a design manual. At least, it appears that some engineers at Atlantic Research Corporation were careful readers of the June 1961 issue which contained an article by George Willard dealing with a small sounding rocket designed by a group of us almost three years ago.

Atlantic Research Corporation, it turns out, has now developed a small meteorological sounding rocket, METROC, with company funds. The METROC is a very interesting little rocket. When compared against the AURORA vehicle detailed in Willard's article, it is even more interesting:

AURORA was to be 40 inches long, 3.75" in diameter, gross weight 22.5 pounds using a steel engine casing; thrust of 150 pounds from an end-burning grain giving a duration of 20 seconds, and capable of carting 2 pounds of instruments to 138,000 feet. It was to be fired from a tube and recovered by parachute.

Herewith the released specs on the ARC METROC: 55" long, 3" in diameter, gross weight 18 pounds with a plastic engine casing, thrust of 130 pounds from an end-burning grain giving a duration of 17.5 seconds, and capable of carting 2–3 pounds of instruments to 100,000 feet. It is to be fired from a tube and recovered by parachute.

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I am certain that no one will accuse Atlantic Research of deliberately lifting a rocket design from Analog. This is probably simply a case of common problem solving in engineering. Give any rocket engineer the problem of carrying 2 pounds of instruments to 100,000 feet, and he is likely to come up with design figures within 10% of the ones above—quite independently. However, I strongly believe that Willard's article may have influenced them, because they are the only group that have followed our line of reasoning about the problem.

However, "the complex problem of the simple weather rocket" hasn't been solved yet. The METROC is only part of the solution. As Willard pointed out, any good development engineer with a knowledge of rockets can come up with the rocket vehicle to do the job.

Although ARC hasn't said anything much about the instrumentation carried in METROC, I'll bet my slipstick that it is simply a repackaged AN/DMQ-6 radiosonde, and that data is taken as the parachute floats the package back down through the atmosphere.

Reason: To my knowledge, nobody has yet developed the sensors capable of getting temperature, humidity, and pressure data while the rocket is going *up*.

When we do have these sensors, there is a rocket vehicle to put them in, providing METROC is cheap enough.

We've taken the first step toward a meteorological rocketsonde system. METROC is a perfectly lovely little rocket.

Say, I wonder if it might be possible for us model rocketeers to get hold of a METROC? It's not very much bigger than some of the models that are flown!——G. Harry Stine

Lessee now . . . If you knew the temperature and pressure of the air instantaneously THEN the relative humidity could be determined in microseconds by measuring its dielectric constant in an air capacitor—

The Analytical Laboratory

June 1962

PLACE	TITLE	AUTHOR	POINTS
1.	The Weather Man,	*Theodore L. Thomas*	1.96
2.	Novice,	*James H. Schmitz*	2.04
3.	Anything You Can Do (Conclusion),	*Darrel T. Langart*	3.33
4.	Three-Part Puzzle,	*Gordon R. Dickson*	3.40
5.	The Sound of Silence,	*Barbara Constant*	4.00

The Editor

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Continued from page 5
partly from pure curiosity—basic research—and considerably for reasons of making money. The modern chemist gets into the business partly through the urge of pure curiosity, and partly to make a living. And the nuclear physicist is trying to perfect his transmutation techniques just as his ancestral alchemist was!

The error in alchemy was that they were trying to do a level of work that could not be handled until several centuries of additional, lower-level data had been accumulated. They were trying to enter the era of nucleonics before they'd learned what the elements were.

There were some three centuries of chemical engineering between where they were and where they thought they were—at the border of the nuclear era.

The astrologers were in somewhat the same position; they needed a very great deal more information about such fundamentals as celestial mechanics, nuclear physics, radiation physics, high-energy particle emission, ionic phenomena, magnetic field effects . . . oh, a very great deal!—before they could even begin to get some of what they thought they were ready for. And, of course, they had a lot of false ideas of what they could get anyway—just as the alchemists thought they could get the Philosopher's Stone.

Basically, Astrology started several millennia ago, when early men first observed the immense effect the cycles of the stars had on events here on Earth. The early Egyptians and Babylonians had no slightest conception of *why* the world grew colder when the cycle of the stars brought Orion rising in the east at twilight—or *why* the world grew warmer again when Lyra rose at dusk, and Orion was no longer visible.

Earliest civilized man observed a very simple, direct, and absolutely unchallangeable fact-of-nature. The movements of the stars predicted the changing of the climate with perfect reliability.

They had not the slightest notion why. But then, they didn't know *why* planting a seed caused a plant to come up. When the world is one vast collection of mysteries, the business of a wise man is to establish some sound, reliable correlations, letting the questions of *why* go until he has more information.

At that stage of history, Man was acutely aware that he had to learn how to make sense out of the Universe he found around him—not demand that the Universe make sense in his terms if it wanted him to accept it!

To us it is obvious that the perfect one-to-one correlation between the cycles of the stars and the climate on Earth was *not* an observation of a cause-effect relationship, but of two effects of a single cause. The clock may mark the time of sunrise, but that correlation doesn't

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prove the clock causes the sun to rise. Obvious . . . to us.

By the time man's first fairly complex high-level civilizations had built themselves, over many laborious centuries, the knowledge that the movements of the stars accurately predicted events on Earth was one of the unarguable established facts. As solidly proven as the fact that planting seeds was necessary to get a crop.

However . . . planting seeds, while necessary, is unfortunately not sufficient to assure a crop. Planting seeds is a Strong and Necessary Magic, and undeniably a very sound and Powerful Magic for crop-producing. (And it's *magic*, bub . . . when you haven't, by several thousand years, reached the stage of building microscopes and ultracentrifuges and microchemical analytical systems capable of studying the immense complexities of RNA and DNA and cytoplasm and genetics.) Just because a Magic doesn't work every time does not—very definitely not!—mean you should reject it as nonsense. Is there anything more supernaturally improbable than that this dry, withered, seemingly dead bit of woody stuff should turn itself somehow into an immense tree? Why, no tale of magical transformation out of the Arabian Nights ever surpassed that!

So . . . given the factual knowledge that the predictable cycles of the stars foretold the coming of events on Earth, it remained only to achieve more sophisticated methods of interpreting the patterns of star-movements to determine the finer details of events on Earth.

Now perhaps we can define an Astrologer as one who studies the stars to establish his conviction that human events on Earth can be predicted by the movements of the stars, and to perfect his ability thereby to predict human events more acutely.

An Astronomer studies the stars to determine what and where they are . . . because he wants to understand the stars.

As of the beginning of the Space Age, we can specify a third profession—the Astro-engineer, who studies the stars *in order to predict what effects they are going to have on human engineering projects.*

An engineer studying the possibilities of a tidal power project would be one example of astro-engineering.

Now be it noted that Alchemy has been dead and dishonored for a couple of centuries, and all sound, properly educated Scientists knew that Transmutation was Impossible, by 1880. Chemistry had, by then rejected *in toto* the concepts of alchemy—philosopher's stone, Earth, Air, Fire and Water, transmutation of the elements—the works.

So here we are transmuting elements, and aware that transmutation of the elements is *the* basic process that makes the Universe go round.

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But here we are also being so amazingly astute and wise that we know for a positive fact that the positions of the planets has nothing whatever to do with any events here on Earth. Oh, the Moon, yes, of course! But what effect could Jupiter, or Saturn, or Mars have on human affairs? How could they possibly affect anything here on Earth? What nonsense to suggest that the relative positions of planets could have any meaning!

And then we have the work of John Nelson, Communications Engineer, who I suggest might well be classified as an Astro-engineer, who has learned to study the positions of the planets in order to predict their effects on human engineering problems.

That solar flares disrupted radio communications here on Earth was a readily ascertained fact—as soon as we had radio communications to be disrupted. Magnetic storms caused by solar flares had been raising hob with maritime navigation for centuries; a ship's compass points generally northward, unless there's a magnetic storm, in which case it's just as apt to point East, West, or if it has a chance, Straight Up. As long power lines were strung across the country, and telegraph and telephone lines, we learned a new aspect of the storms—they could induce perfectly deadly voltages and currents in long conductors.

John Nelson has shown—by making ninety-three per cent accurate predictions, when a time accuracy of ±10 minutes at 5-day ranges—that the occurrence of solar flares can be predicted by observing the patterns of the planets.

Now this is something entirely new in observational science; it is a proven instance of a *pattern* having an effect that the *elements of the pattern* do not have. It's true that chemists ran into that phenomenon at the molecular level—CH_3-O-CH_3 has the same elements as CH_3 CH_2 OH but a radically different effect!—but to find that a *pattern-arrangement of the planets* has immensely significant effects that the planets themselves do not is a very different thing indeed.

And it means that a phenomenon has been demonstrated to be valid without anyone yet having been able to explain why it is valid. It works . . . and we don't know why.

I fear that, little as Science likes that situation, that is a problem that will arise through all the megayears of history yet to come. Obviously any time a really new phenomenon is stumbled on, it will have exactly that characteristic.

Nelson's work during the past seven years has been of immense value to the communications industry; his motivation in studying the stars and planets is not that of the astrologer, nor that of the astronomer. He's not interested in the stars and planets for their own sakes; he's interested in them as

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what I think we should call an astro-engineer—to find out how to arrange his engineering problem, long distance communications by radio, in view of the observed effects those bodies have.

When a solar flare lets loose, it would be quite appropriate to say that all Hell is out for noon. The article "Gravity Insufficient," by Hal Clement, in the November 1961 issue gave a discussion of what has been found out about solar flares and their effects. It's painfully clear that when a solar flare cuts loose, any man outside of Earth's atmosphere—and no man has yet gone outside; neither Russian nor American capsules were beyond the protective layers of the upper atmosphere—in any space-capsule present technology can lift off the ground would be a well cooked goose. If he were in an orbit at 100,000 miles—he'd have to be about that far out to get beyond the normal Van Allen belt—he'd have to spend days getting there, making one orbit, and getting back. If a flare occurred at any time during that period, he would be completely helpless.

A flare can develop in a period of about fifteen minutes. Eight minutes after it gets going, the X-radiation arrives at Earth's orbit, X-radiation of a hardness and intensity such that any shielding we could lift off the launching pad would be useless.

If the astro- or cosmo-naut caught out in the solar storm started for home right then . . . it would be futile. Remember, the limitations of modern technology will mean he has to come in by using retrorockets to change his near-circular orbit to a grazing-ellipse orbit. And to get through the *normal* Van Allen belt safely, he must break his orbit at the right part of its 320,000 mile circumference and come in to the lower atmosphere through one of the magnetic-polar tunnels through the Van Allen radiations. He won't have rocket power enough to simply turn his ship around, blast for home on an emergency short-cut orbit, and get out of the solar storm.

It would take him a day or more on the fastest orbit home he could make.

Beginning a few minutes after the X rays arrive at the speed of light, some extremely high-speed electrons will be showing up. They won't penetrate even the thin metal walls of a space-capsule . . . but the X rays generated when the walls do stop them will. Shortly after the fastest electrons will come the fastest nuclei—protons largely, traveling at very near light-speed. Gradually, the intensity of radiation will increase as the greater numbers of slower protons and electrons make the 93,000,000 mile trip from the Sun.

Long before the spaceman could get down even so far as the outer Van Allen belt, that belt would be enormously surcharged with trapped ions from the solar flare. The radiation in the belts would, by that

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time, be so deadly as to kill him in minutes if he did try penetrating.

Any astronaut caught off Earth in a modern space-capsule—or any in the foreseeable future of present technology—will be as dead as if he'd taken a swim on one of those swimming-pool tractors.

The space agencies of all nations will have to employ astro-engineers like John Nelson, who can predict what's going to happen to human engineering projects, by studying the pattern of positions of the planets.

One can imagine the shop-talk of a couple of astrogators in years ahead. "Well, on this run we had to get through before May 31st, or the line lost that contract for good. But look, we had Jupiter and Saturn practically dead-on at quadrature, with Mars in opposition to Saturn. Earth was neutral, and the only favorable planet we had was Venus in trine with Jupiter. So Harmonson, the damn fool, says sure we can make it, and accepts the run! With a planetary pattern like that he thinks he can get by without a flare, yet! So . . ."

They'll sound like astrologers. They certainly won't sound like astronomers—because astrogators won't be interested in the stars and planets for their own sweet sakes. They'll be very strictly practical in their interests; they won't care *why* certain planetary patterns trigger solar flares—but they'll have an acute personal interest in the fact *that* they do! They'll carefully consult the pattern of the planets to determine whether their aspects are propitious. If they've got Jupiter, Saturn and Mars situated 120° apart around the Sun, it'll be a milk run. The Sun doesn't flare, when those planets are 120° apart.

It was the alchemists, not chemists, who first learned to make oil of vitriol, and corrosive sublimate and aqua regia—and our modern technological culture would break down without the megatons of oil of vitriol we need.

It begins to look, now, as though it's time to go back and glean through astrology, with the vast funds of new knowledge and new techniques available.

We're damn well going to need astro-engineers in the next few decades!

The Editor.

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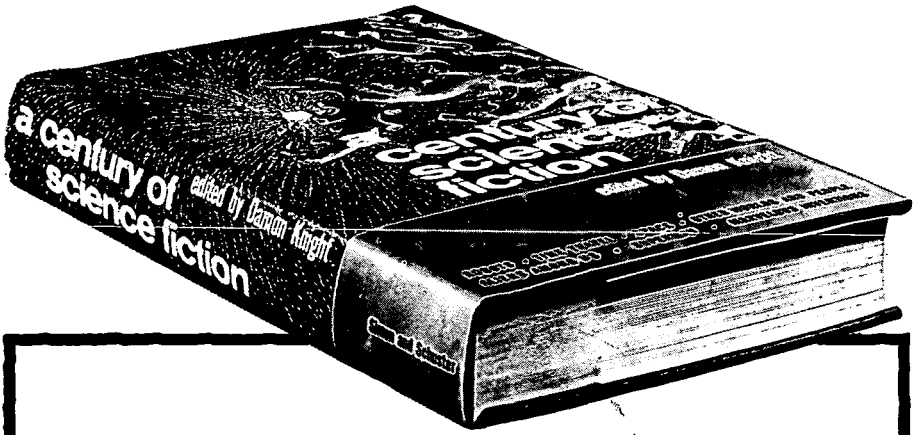

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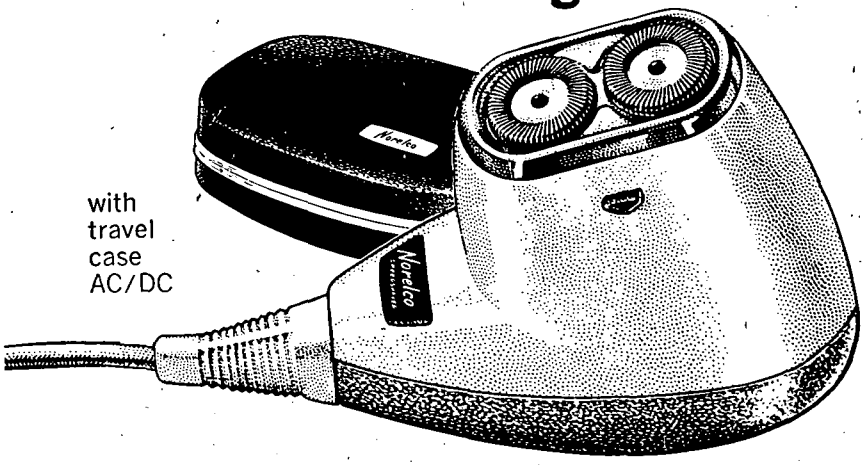

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